

8<sup>th</sup> Annual Enhancing Neuroscience **Diversity through Undergraduate Research Education Experiences (ENDURE) Meeting** 

# November 3, 2018 San Diego, CA

The NIH Office of the Director and these NIH Institutes and Centers participate in the NIH Blueprint for Neuroscience Research:

- NCATS •
- NCCIH
- NEI
- NIA

- NIAAA
- NIBIB
- NICHD
- NIDA
- - NIEHS NIMH
    - NINDS

NIH Blueprint for Neuroscience Research

NIDCR

- NINR
- OBSSR

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## ENDURE PROGRAM GOALS

The Blueprint initiative "Enhancing Neuroscience Diversity through Undergraduate Research Education Experiences (ENDURE)" aims to raise interest and opportunities in neuroscience research for individuals who are typically underrepresented in the neurosciences. The goal is to provide such individuals with training at the undergraduate level, so that they are prepared to enter and successfully complete neuroscience PhD programs. ENDURE provides undergraduate training through partnerships between research-intensive institutions and institutions with a substantial enrollment of neuroscience majors from diverse groups. This includes individuals from underrepresented racial and ethnic groups; individuals with disabilities; and individuals from economically disadvantaged backgrounds. ENDURE undergraduate training programs support a range of activities to increase student interest and involvement in the neurosciences, including research experiences, core and advanced neuroscience courses, seminars, and journal clubs. In FY10, five ENDURE awards were granted. In FY15, six ENDURE awards were granted.

## MEETING GOALS

As issued, the RFA (<u>RFA-NS-14-010</u>) cites "it is a goal of this initiative that the NIH Blueprint Institutes will convene an annual meeting that will bring together BP-ENDURE program directors and participating students." The purpose of the meeting will be to discuss best practices and provide a forum for student scientific and academic enhancing activities. An additional goal and outcome for this annual meeting is to provide linkage and opportunity for collaboration with existing diversity (example: Neuroscience Scholars Program) and undergraduate (example: Faculty for Undergraduate Neuroscience) programs already at Society for Neuroscience. The students will enhance their networks with other ENDURE participants, peer mentoring from diverse graduate students, and T32 program directors.

## THE ORGANIZING COMMITTEE

| Dr. Michelle Jones-London (NIH/NINDS)        | Dr. Mark Chavez (NIH/NIMH)         |
|--|------------------------------------|
| Dr. Edgardo Falcón-Morales (NIH/NINDS)       | Dr. Lauren Ullrich (NIH/NINDS)     |
| Karen Gibson-Serrette (Longevity Consulting) | Anika Smith (Longevity Consulting) |

For further information about the program and its training sites: <u>https://neuroscienceblueprint.nih.gov/endure-undergraduate-education</u>

ENDURE Trainees and Alumni Visit and like the ENDURE Facebook page: An ENDUREing Network www.facebook.com/BP.ENDURE

Follow NINDS Diversity on Twitter @NINDSDiversity

## The ENDURE FOA has been re-issued: <u>RFA-NS-19-007</u> Application Due Date: February 15, 2019



### Enhancing Neuroscience Diversity through Undergraduate Research Education Experiences (ENDURE) 8<sup>th</sup> Annual Meeting

Hilton San Diego Bayfront, Sapphire Ballroom November 3, 2018

- 7:00 7:30 am Registration
- 7:30 7:40 am
   ENDURE Meeting Goals and Introduction

   Dr. Michelle Jones-London, Chief, Office of Programs to Enhance Neuroscience

   Workforce Diversity (OPEN), National Institute for Neurological Disorders and Stroke (NINDS)
- 7:40 8:05 am NIH Blueprint Welcome and Scientific Presentation Dr. Eliezer Masliah, Director, Division of Neuroscience, National Institute on Aging (NIA) Q&A
- 8:05 9:45 am Panel on "Pathways and Perspectives on Being a Researcher" Chair and Panel Introductions: *Dr. Mark Chavez*, Division of Adult Translational Research and Treatment Development, National Institute of Mental Health (NIMH)

A discussion framed by several specific questions: What a graduate student should expect both of the school and themselves? How to identify a good mentor? Why a career in neuroscience research is fulfilling? How do I prepare for and navigate some of the challenges of graduate school?

Each accomplished researcher will share their research background and answer the general questions from their respective lens including early lessons from graduate school, being a diverse scientist, and the big picture view of a research career

- Dr. Huda Zoghbi Professor, Baylor College of Medicine
- Dr. Angela Ozburn Assistant Professor, Oregon Health and Science University School of Medicine; Research Biologist, Veterans Affairs Portland Health Care System
- Dr. Yarimar Carrasquillo Investigator, Section on Behavioral Neurocircuitry and Cellular Plasticity, National Center for Complementary and Integrative Health (NCCIH), NIH
- Justin A. Brantley Graduate Student, University of Houston (NIH Blueprint F99/K00 Awardee)

#### 9:45 – 11:30 am T32 Recruitment and Networking Fair Institutions with a strong record of neuroscience training and interested in recruiting for predoctoral research programs

## NIH BLUEPRINT FOR NEUROSCIENCE RESEARCH

The NIH Blueprint for Neuroscience Research, known as "Blueprint", is a collaborative framework that includes the NIH Office of the Director and 14 NIH Institutes and Centers that support research on the nervous system. By pooling resources and expertise, Blueprint identifies cross-cutting areas of research, and confronts challenges too large for any single Institute or Center.

### This year's NIH Blueprint welcome is presented by Dr. Elizer Masliah, NIA



### Elizer Masliah, MD

Director, Division of Neuroscience National Institute on Aging (NIA)

Dr. Masliah joined the NIA/NIH as Director of the Division of Neurosciences in the summer of 2016. Dr. Masliah received his M.D. from the National Autonomous University of Mexico in 1982. He completed a postgraduate residency training in pathology at the National Institutes of Health in Mexico City in 1986. Following a fellowship in neuropathology and neurodegenerative disorders at the University of California, San Diego (UCSD), before joining NIA, he held joint appointments as a tenured Professor in the

Departments of Neurosciences and Pathology and as Director of the Autopsy Service at UCSD-Medical Center.

As head of UCSD's Experimental Neuropathology Laboratory, he investigated synaptic damage in neurodegenerative disorders such as Alzheimer's disease, Parkinson's disease, dementia with Lewy bodies, multiple system atrophy and AIDS-related dementia. His laboratory was involved with the discovery of alpha-synuclein and developed novel models of neurodegeneration as well as new gene therapies, small molecules and experimental immunotherapies for Alzheimer's disease and Parkinson's disease. Four of the experimental therapeutic approaches developed at his laboratory targeting alpha-synuclein have now passed Phase I clinical trials. He also directed the neuropathology core of the NIA-supported Shirley-Marcos Alzheimer's Disease Research Center.

A prolific author with approximately 800 original research articles, 70 book chapters and dozens of patents, Dr. Masliah has familiarity with NIA as a past member of the NIA National Advisory Council on Aging, the NIA Neuroscience of Aging Study Section, and the Cellular and Molecular Biology of Neurodegeneration Study Section. He has also served as an advisor in the expert panels to revise the criteria for the neuropathological diagnosis of Alzheimer's Disease organized by the NIA and the Alzheimer's Association, at expert meetings and workshops to advise in the use of preclinical models for Alzheimer's Disease and at a series of NIH-hosted Summits on Alzheimer's Association from 2010-2016". As Director of the Division of Neurosciences at NIA, Dr. Masliah is responsible for managing the portfolios and providing leadership on NIH sponsored programs dedicated at better understanding brain aging and Alzheimer's Disease, the Division plays a key role in developing the implementation research milestones targeting the ultimate goal of the National Plan to Address Alzheimer's Disease, which calls for the nation to identify effective ways to treat or prevent Alzheimer's disease and related dementias by 2025. Dr. Masliah also participates at the NIA Intramural program as investigator in the Laboratory of Neurogenetics.

## PANEL SPEAKERS

Each accomplished researcher will share their research background and answer general questions from their respective lens including early lessons from graduate school, being a diverse scientist, and the big picture view of a research career.



### Huda Zoghbi, MD

Professor, Pediatrics, Neurology, Neuroscience and Molecular and Human Genetics Baylor College of Medicine

Huda Zoghbi is Professor of Pediatrics, Neurology, Neuroscience, and Molecular and Human Genetics at Baylor College of Medicine, an Investigator with the Howard Hughes Medical Institute, and the founding Director of the Jan and Dan Duncan Neurological Research Institute at Texas Children's Hospital.

Dr. Zoghbi's interests range from neurodevelopment to neurodegeneration. Her discovery (with Harry Orr) that Spinocerebellar

Ataxia type 1 is caused by expansion of a polyglutamine tract and her subsequent studies that such expansion leads to accumulation of the mutant protein in neurons has had profound ramifications since many late-onset neurological disorders involve similar accumulations of disease-driving proteins. Zoghbi's work in neurodevelopment led to the discovery of the gene *Math1/Atoh1* and to showing that it governs the development of several components of the proprioceptive, balance, hearing, vestibular, and breathing pathways. Zoghbi's group also discovered that mutations in *MECP2* cause the postnatal neurological disorder Rett syndrome and revealed the importance of this gene for various neuropsychiatric features. Zoghbi trained many scientists and physician-scientists and is a member of several professional organizations and boards. She has been elected to the National Academy of Medicine, the National Academy of Sciences, and the American Academy of Arts and Sciences. Among Dr. Zoghbi's recent honors are the Pearl Meister Greengard Prize from Rockefeller University, the March of Dimes Prize in Developmental Biology, the Shaw Prize in Life Science and Medicine, the Breakthrough Prize in Life Sciences, Canada Gairdner International Prize, and Honorary degrees from Yale University, Harvard University and the University of Massachusetts Medical School.



### Yarimar Carrasquillo, PhD

Investigator

Behavioral, Neurocircuitry and Cellular Plasticity Section National Center for Complementary and Integrative Health (NCCIH)

Dr. Yarimar Carrasquillo was born and raised in Puerto Rico, where she received her B.S. in Biology from the University of Puerto Rico (UPR), Rio Piedras. She was first exposed to basic science research as a RISE (Research Initiative for Scientific Enhancement) scholar at the UPR, in the lab of Dr. Sandra Peña de Ortiz, studying mechanisms of learning and memory. Dr. Carrasquillo received her Ph.D. in Neuroscience from Baylor College of Medicine. Her graduate work in the lab of Dr. Robert W.

Gereau revealed a direct causal link between plastic changes in the amygdala and the modulation of pain processing in pathological states. As a graduate student, Dr. Carrasquillo further demonstrated that the right amygdala has a dominant function in pain processing. The findings from her graduate work have served as the foundation and have significantly impacted other studies aimed at investigating the mechanisms of pain processing in the brain, particularly the central amygdala. Her postdoctoral studies in the lab of Dr. Jeanne Nerbonne at Washington University School of Medicine focused on defining the molecular mechanisms controlling the functional expression of voltage-gated Na+ and K+ channels and their physiological functions in regulating neuronal excitability and behavioral output. These studies revealed that the molecular determinants of ionic conductances are heterogenous, that accessory subunits play critical functions in the modulation of ion channels and that the mechanisms underlying the regulation of neuronal excitability in central neurons are cell-type specific. Dr. Carrasquillo joined the PAIN Branch at NCCIH as a Principal Investigator in 2014 where she directs a multifaceted, multidisciplinary research program focused on delineating the cellular, molecular and circuit-level mechanisms that underlie pain perception and modulation in the brain.



### Angela Ozburn, PhD

Assistant Professor, Department of Behavioral Neuroscience Oregon Health & Science University Research Biologist, Basic Laboratory Research & Development, Portland Veterans Affairs Health Care System

Dr. Ozburn earned a B.S. in Biochemistry (2000) and Neurobiology (2002), and Ph.D. in Neuroscience (2009) from University of Texas at Austin. Her long-term career goals are to move science forward by 1) understanding molecular mechanisms that underlie addiction, 2) improving treatment for alcohol and substance use disorders, and 3) mentoring the next generation of neuroscience researchers. Despite

advances in basic neuroscience and clinical psychiatry, we have much to gain in our understanding of how to bridge the gap between these two areas of research.

As an undergraduate researcher, she studied the effects of fetal alcohol exposure on the developing brain. During this time, she realized that she loved learning about the brain, and wanted to study how molecules can make us who we are and how experiences can change our brain. She went on to study the behavioral genetics of alcohol-related behaviors as a graduate student with Drs. Adron Harris and Yuri Blednov at the University of Texas at Austin. She knew early in her training that she wanted a career in academia and planned to continue training after receiving a Ph.D. to develop a larger tool kit and gain exposure to different ways of thinking. Dr. Colleen McClung recruited her as a post-Doctoral Fellow at the University of Texas Southwestern Medical Center in Dallas, Texas (2009-2011). In 2011, her mentor moved to the University of Pittsburgh Medical Center in Pennsylvania, where she continued her training to study the role of circadian genes in mood- and drug-related behaviors. In 2014, she was recruited for a dual appointment by the Division of Research & Development at the VA Portland Health Care System and the Department of Behavioral Neuroscience at Oregon Health & Science University.

Research in her lab is focused on using novel approaches in bioinformatics to identify therapeutic compounds that oppose drug-induced molecular signatures and to determine whether chronic treatment can reduce drug taking and "reverse" drug-induced changes in the brain. The lab is currently using several complementary approaches in mice to carry out this work: a) clinically relevant drug self-administration models, b) identification of transcriptional mechanisms and the regulation of gene expression using RNA and ChIP Seq, qPCR, and Western blotting, c) characterizing novel pharmacological therapies (identified via informatics approaches) in a behavioral battery of drug- and mood-related assays, and d) identifying localization of function by using intracranial drug administration or viral-mediated gene transfer to manipulate targets or gene expression. She has published 21 manuscripts in peer-reviewed journals, been awarded 12 competitive peer-reviewed grants, and received 37 honorific awards. She also dedicates a significant portion of her time to training individuals from underserved areas to become the next generation of scientists and physicians.



Justin Brantley, MS Student and Research Assistant University of Houston

Mr. Brantley is a Ph.D. student and research assistant in the *Laboratory for Noninvasive Brain Machine Interfaces* at the University of Houston. He studies able-bodied individuals and lower limb amputees to understand the involvement of peripheral and central nervous signaling in lower limb movements and the effect of limb loss on the brain. He uses simultaneously recorded electroencephalography (EEG), electromyography (EMG), and full body motion capture to study brain, muscle, and kinematic patterns during multi-terrain walking and

isolated limb movements. He is using the information to develop a closed-loop brain and muscle based neural-machine interface for the control of a powered lower limb prosthesis. In addition, he is interested in projects at the interface of arts, science, and engineering, and has co-led an investigation into the neural basis of aesthetic stimulation and creativity by evaluating the cortical dynamics of art viewers in an unconstrained non-traditional laboratory environment. Justin was born and raised in Albuquerque, New Mexico. He received a B.S. in Mechanical Engineering from New Mexico State University and a M.S. in Biomedical Engineering at the University of New Mexico. In his free time, Justin enjoys rock climbing and the outdoors, experimenting in the kitchen, and playing his guitar.

| University/School   | Representative  |
|---|---|
| BROWN UNIVERSITY  | Anne C. Hart, PhD<br>Professor of Biology<br>Diane Lipscombe, PhD<br>Professor of Neuroscience  |
| CASE WESTERN RESERVE UNIVERSITY                               | Xiongwei Zhu, PhD<br>Professor of Pathology, General Medical Sciences,<br>and Neurology   |
| COLUMBIA UNIVERSITY   | Darcy Kelley, PhD<br>Professor of Neurobiology  |
| GEORGETOWN UNIVERSITY   | Edith Brignoni-Pérez<br>Graduate Student<br>John W. VanMeter, PhD<br>Associate Professor  |
| HARVARD MEDICAL SCHOOL  | Corey Harwell, PhD<br>Assistant Professor<br>Taralyn Tan, PhD<br>HMS Curriculum Fellow  |
| JOHNS HOPKINS UNIVERSITY SCHOOL OF MEDICINE                   | Patricia Janak, PhD<br>Bloomberg Distinguished Professor<br>David Ottenheimer<br>Graduate Student<br>Lionel Rodriguez<br>Graduate Student   |
| NATIONAL INSTITUTES OF HEALTH, INTRAMURAL<br>RESEARCH PROGRAM | <b>Rita Devine, PhD</b><br>Assistant Director for Science Administration, NINDS   |
| NEW YORK UNIVERSITY   | Chiye Aoki, PhD<br>Professor of Neural Science and Biology<br>Heather McKellar, PhD<br>Program Manager, Neuroscience Institute<br>Rachel Weintraub-Brevda, PhD<br>Program Coordinator   |
| OREGON HEALTH & SCIENCE UNIVERSITY                            | Jessica Parks-Piatt<br>Program Administrator<br>Gary Westbrook, MD<br>Senior Scientist and Co-Director. Vollum Institute  |
| PRINCETON UNIVERSITY  | Paula Brooks         Graduate Student         Ed Clayton, PhD         Sr. Project Manager, Princeton Neuroscience Institute         Rolando Masis Obando         Graduate Student         Ken Norman, PhD         Professor of Psychology         Jamal Williams         Graduate Student |
| STANFORD UNIVERSITY   | Anthony Ricci, PhD<br>Professor   |
| TEMPLE UNIVERSITY   | Lisa Briand, PhD<br>Assistant Professor<br>Ellen Unterwald, PhD<br>Professor  |
| UNIVERSITY OF ALABAMA AT BIRMINGHAM                           | Leland Fleming<br>Graduate Student<br>Rylie Hightower<br>Graduate Student<br>Lori McMahon, PhD<br>Professor and Dean, UAB Graduate School   |

| UNIVERSITY OF CALIFORNIA BERKELEY                        | Candace Groskreutz<br>Neuroscience Graduate Program Manager<br>Dan Feldman, PhD<br>Professor of Neurobiology<br>Michael Silver, PhD<br>Associate Professor and Director, Neuroscience<br>Graduate Program |
|--|---|
| UNIVERSITY OF CALIFORNIA DAVIS                           | W. Martin Usrey, PhD<br>Professor   |
| UNIVERSITY OF CALIFORNIA SAN DIEGO                       | Brad Voytek, PhD<br>Assistant Professor<br>Amy Taylor<br>MD/PhD Student   |
| UNIVERSITY OF COLORADO<br>DENVER                         | Diego Restrepo, PhD<br>Professor, Cell and Developmental Biology Director,<br>Center for NeuroScience (CNS)<br>Deanne Sylvester<br>Neuroscience Program Administrator                                     |
| UNIVERSITY OF IOWA                                       | C. Andrew Frank, PhD<br>Assistant Professor<br>Marco Pipoly<br>Graduate Student   |
| UNIVERSITY OF MARYLAND                                   | Mary Kay Lobo, PhD<br>Associate Professor<br>Georgia Rogers<br>Academic Services Specialist   |
| UNIVERSITY OF MICHIGAN                                   | Audrey Seasholtz, PhD<br>Professor, Biological Chemistry  |
| UNIVERSITY OF PENNSYLVANIA                               | Christine Clay<br>Coordinator, Neuroscience Graduate Group<br>Joshua Gold, PhD<br>Professor and Chair, Neuroscience Graduate Group<br>Kelly L. Jordan-Sciutto, PhD<br>Professor of Pathology              |
| UNIVERSITY OF TEXAS HEALTH SCIENCE CENTER SAN<br>ANTONIO | David Morilak, PhD<br>Professor of Pharmacology   |
| UNIVERSITY OF UTAH                                       | Christopher Gregg, PhD<br>Assistant Professor   |
| UNIVERSITY OF WASHINGTON                                 | Jane Sullivan, PhD<br>Associate Professor, Physiology and Biophysics  |
| VANDERBILT UNIVERSITY                                    | Danny G. Winder, PhD<br>Professor, Molecular Physiology and Biophysics;<br>Psychiatry   |
| WAKE FOREST UNIVERSITY                                   | Carol Milligan, PhD<br>Professor, Neurobiology and Anatomy  |
| WASHINGTON UNIVERSITY IN ST. LOUIS                       | Tamara Hershey, PhD<br>Professor<br>Erik Herzog, PhD<br>Professor   |
| YALE UNIVERSITY  | Michael Crair, PhD<br>Professor and Director, Graduate Studies<br>Charles A. Greer, PhD<br>Professor of Neurosurgery and of Neuroscience  |

## T32 RECRUITMENT FAIR PARTICIPANTS

### **Brown University**

Program Representative(s): Diane Lipscombe, PhD, and Anne C. Hart, PhD <u>http://neuroscience.brown.edu/graduate/</u>

Our Interdisciplinary Predoctoral Neuroscience Training Program strives to provide individualized, high quality training to predoctoral students interested in pursuing scientific research careers in the biological and biomedical sciences. Graduate students in our program receive broad, multi-disciplinary training that spans many levels of inquiry, from genes through cognition, and emphasizes concepts, methodologies, quantitative skills, and sophisticated analysis of the primary literature. Our core curriculum consists of team-taught graduate courses, seminars, and workshops that provide a strong scientific foundation in neuroscience and develop skills that are essential for successful, independent research careers in neuroscience, such as effective science writing and oral presentation, knowledge of scientific review processes, and training in ethics. We have introduced new initiatives to expose students to translational and clinical neuroscience with our Bench to Bedside seminar series. On average, students in our program finish their Ph.D. in 5.35 years, and the majority of our alumni continue their careers in science-related fields including academic or industry science positions. We foster an environment unconstrained by traditional discipline boundaries and where graduate students are encouraged to work at the interfaces of these disciplines. The faculty trainers are drawn from seven different Brown University departments: Neuroscience; Cognitive, Linguistic, and Psychological Sciences; Molecular Biology, Cell Biology, and Biochemistry; Engineering; Molecular Pharmacology, Physiology and Biotechnology; Biostatistics; and Neurosurgery. They are a distinguished and energetic group of brain scientists that collectively cover the spectrum of modern neuroscience research: they work with a wide variety of model organisms, from worms to humans, and use an array of modern neuroscience techniques, including functional MRI, applications of robotics and neuroprosthetics, optogenetics, advanced in vivo and in vitro electrophysiological recordings, mouse transgenics, behavioral studies, molecular manipulations of neuronal genes, functional proteomics, and human genome-wide association studies. We encourage and facilitate collaborations between labs as well as research in computational and translational neuroscience that typically reside at the interface of disciplines. Key features of the Neuroscience Graduate Program at Brown include: excellence in research along with excellence in education and mentorship; a history of interdisciplinary and translational research; rigorous training in experimental design and quantitative methods; and an environment of highly productive labs where graduate students are equal partners in the research process.

### Case Western Reserve University

Program Representative(s): Xiongwei Zhu, PhD <u>https://case.edu/medicine/neurosciences/training/graduate-training/</u>

The Department of Neurosciences offers graduate training in a wide range of disciplines in modern neuroscience. The neurosciences graduate program has a strong emphasis on cellular and molecular mechanisms that mediate the function and development of the nervous system. Training in neurobiology is provided through a combination of research, course work, and seminars. Thesis research opportunities are available with more than 20 faculty members working in areas such as development of sensory and motor systems, regeneration, sensory and cognitive neuroscience, pathway-finding by axons, synaptic function and plasticity, neurotrophin gene expression and trophic regulation, aging, neuron-glial interactions, simple neural circuits and neural modeling, regulation of neurotransmitter and receptor expression, and neurogenetics. One feature of the department that makes it a particularly attractive training environment is the highly interactive atmosphere, characterized by extensive collaboration among laboratories and with other departments in the university.

### **Columbia University**

Program Representative(s): Darcy Kelley, PhD http://www.neurosciencePh.D.columbia.edu/

Columbia University's-wide Doctoral Program in Neurobiology in Behavior (NB&B) was founded in 1995 by John Koester and Darcy Kelley. NB&B includes 50 neuroscience training faculty from 10 departments on both the Medical School and Arts and Sciences campuses that serve as Ph.D. mentors and/or participate actively in NB&B teaching and governance. Sixty-six additional faculty members serve as potential research rotation and dissertation sponsors. Students are admitted directly to the program by a fifteen-member Admissions Committee of training faculty. US students receive individual fellowship support from the NSF, DOD and NIH (pre-doctoral NRSAs). Non-US students receive external support from Fullbright, NSERC (Canada) and the HHMI. The training program opens with a "Boot Camp", a two-week introduction to current research approaches, followed by a neuroscience survey course and three advanced seminars. Research rotations, typically three, are taken in the first year. In addition, students complete three professional development courses led by the NB&B Program Co-directors: a first-semester course focused on developing a research fellowship proposal, a second-semester course on responsible conduct of science and a professional development course for advanced students. Students are directly supervised by the Co-directors in years one and two. By the beginning of the second year, students choose a thesis laboratory and take a qualifying examination to advance to candidacy by the beginning of year 3. The qualifying examination committee typically constitutes the core of the thesis advisory committee that meets yearly with each student through year four and every 3 to 6 months prior to thesis defense, typically 5.5 - 6.5 years post-matriculation. All students attend the weekly NB&B research seminar, a student journal club and lab meetings. A NB&B Program-wide retreat is held biannually and students receive support to attend scientific meetings.

#### **Georgetown University**

Program Representative(s): Edith Brignoni-Pérez and John VanMeter, PhD <u>https://neuroscience.georgetown.edu/</u>

The Interdisciplinary Program in Neurosciences (IPN) at Georgetown University is the largest biomedical Ph.D. granting program at Georgetown University. This broad-based, transdisciplinary, non-departmental program leads to a Ph.D. in Neuroscience. The IPN was established in 1994, and has been supported by NIH since 2000. The primary goal of this training program is to develop "Stewards of the Discipline" by training students in the scholarly pursuit of research in integrative neuroscience. Our students are trained in a multi-level approach: from genes to cells to behaving organisms. The 29 core training faculty and 17 supporting faculty in this program are drawn from 14 clinical and basic science departments on the Main Campus and Medical Center, which are combined at Georgetown University's campus in Washington, DC. These faculty span a breadth of inquiry, ranging from neurotransmitter receptors and signal transduction, to behavior and human disease. Particular areas of research strengths include 1) neural injury, degeneration, and plasticity; 2) synaptic modulation and signal transduction; 3) neural substrates of autism, epilepsy, dementias; and 4) telencephalic neural networks subserving sensory processing, memory and language. Students gain training in a range of approaches, including molecular, genetic, neurophysiological, cognitive testing, computational and imaging techniques. The program enrolls 40-50 thesis and prethesis students. Aggressive recruitment of underrepresented racial and ethnic applicants has been successful (over 20% of students), and continues to be a top priority. The training environment fosters interactive, transdisciplinary research of both faculty and trainees. The IPN faculty are highly collaborative; students are encouraged to seek co-mentorship between faculty with interfacing interests and complementary approaches. Core training faculty have research grant support and fully equipped facilities for training pre-and postdoctoral students. The training program includes broad-based didactic coursework, as well as rotations in laboratories of the training faculty. The trainees participate in a seminar series, national professional meetings, journal clubs, intensive laboratory research, and training in several essential professional skills (writing and reviewing manuscripts, grantsmanship, mentorship, teaching, conflict resolution, career choices, oral presentations) and their ethical dimensions. Students are also very active in governance of the IPN. Opportunities for gaining practical teaching experience at the undergraduate and secondary school levels are abundant and encouraged.

#### Harvard University School of Medicine

Program Representative(s): Corey Harwell, PhD, and Taralyn Tan, PhD <u>http://dms.hms.harvard.edu/neuroscience/</u>

The goals of the interdepartmental Ph.D. Program in Neurosciences at Harvard University program, established in 1981, are (1) to organize within a single training faculty the neuroscientists at Harvard Medical School, its affiliated hospitals, and Harvard College; and (2) to train research scientists and teachers who are interested in mental health, diseases of the nervous system, and fundamental mechanisms of the brain. The program is designed to provide trainees with a broad and thorough background in neuroscience and to mentor them in performing original and rigorous research in important areas of neuroscience. In the first 18 months, trainees complete a sequence of core courses ranging from cell and molecular neurobiology to systems neuroscience, as well as collateral courses selected from cell and molecular biology, immunology, statistics, and other subjects appropriate to individual interests. Students rotate through three different laboratories. Following the coursework, laboratory rotations, and a preliminary examination, students begin full time dissertation research. They are also involved in other ongoing training activities including journal clubs, seminars, and data presentation. There are currently 100 graduate students enrolled in the Program in Neuroscience. The total faculty includes 118 members. Considerable effort has gone into making this program a highly interactive group with extensive formal and informal contacts between students and faculty. Graduates of this program have a high rate of staying in careers in biomedical research and make substantial contributions to a growing understanding of neuroscience.

#### Johns Hopkins University School of Medicine

Program Representative(s): David Ottenheimer, Lionel Rodriguez, and Patricia Janak, PhD <u>http://neuroscience.jhu.edu/</u>

The Neuroscience Training Program (NTP) at Johns Hopkins University was established in 1983 to provide students with advanced instruction and research training in the neurosciences. It now includes 92 training faculty in 21 different departments across the university, as well as several associated institutes (National Institute of Drug Abuse, Mind-Brain Institute, Brain Science Institute) where neuroscience research is performed. In addition, the NTP has a joint graduate program with the Howard Hughes Medical Institute, and students have the opportunity to perform thesis research at the Janelia Research Campus of HHMI. The program encompasses a broad array of research areas, including molecular, cellular, developmental, sensory, systems, cognitive, and computational neuroscience, as well as neurobiology of disease, providing diverse training options and unique opportunities for collaboration for our students. We typically matriculate 10-12 Ph.D. candidates each year, from a pool of ~350 applicants, and 1-4 additional candidates for combined M.D./Ph.D. degrees (who are admitted through a separate process). Students enter the program with diverse backgrounds ranging from computer science to biochemistry. To ensure that they learn the basic tenets of neuroscience, they are required to take a year-long integrative lecture and laboratory course, "Neuroscience and Cognition," as well as statistics and a perspective/orientation course, "Science, Ethics, and Society." Students learn about research opportunities through a mini-symposium series led by Program Faculty (featuring short chalk talks), the Department Retreat, and Lab Lunches (which feature work-inprogress by NTP faculty). This information is used to help students arrange three 12-week laboratory rotations, which are typically completed by the end of the first academic year, and form the basis for selecting a thesis advisor. By the end of the second year, students have completed five elective courses, from 20 small seminar-style courses in different neuroscience specialties or relevant courses offered in other departments. At the end of Year 2, students write and defend a Thesis Proposal that is written in the form of a Predoctoral NRSA application. Each student in mentored by two Pre-thesis Advisors in Years 1-2 (at 3 month intervals) and an individualized Thesis Advisory Committee thereafter (at 6-12 month intervals). Thesis Advisory Committees report student progress to the Graduate Program Steering Committee, which carefully tracks the advancement of each student in the program and establishes overall program policy. At present, 75 students are enrolled in the NTP. The average time to complete the Ph.D. for the past ten years is 5.7 years. Of the students who have graduated from our program, 92% are pursuing careers in science or medicine. Students who are interested in careers outside academia (pharmaceutical industry, data science, science

policy) are provided opportunities to gain additional exposure and training appropriate for these disciplines.

### National Institutes of Health (NIH) Intramural Research Program

Program Representative(s): Rita Devine, PhD https://www.training.nih.gov/programs/gpp

The NIH Intramural Program offers a broad array of training programs in the biomedical sciences. One of them is the Graduate Partnerships Program (GPP). The GPP is designed to bring Ph.D. graduate students to the NIH Intramural Research Program for dissertation research. Participants enjoy the academic environment of a university, the extensive research resources of the NIH, and the breadth and depth of the research programs of both the host university and the NIH Intramural Research Program (IRP). The goal is to create a different kind of graduate experience, one that focuses on training the next generation of scientific leaders by emphasizing communication and collaboration skills, integration of information, and interdisciplinary investigation. At the NIH, graduate students work in a highly collaborative research environment with leading scientists and clinicians. They share the NIH campus with the largest translational research hospital in the nation. They explore areas such as bioinformatics, biophysics, epidemiology, immunology, cell and molecular biology, neuroscience, health sciences, structural biology, sensory and communication neuroscience, molecular pathology, biobehavioral research, and developmental biology. All graduate students at the NIH are part of the GPP and can take advantage of the graduate student community as well as career and professional development services supported by the Office of Intramural Training & Education (OITE). Graduate students come to the NIH in one of two ways: Institutional Partnerships - the pathway for students wishing to enroll in a Ph.D. program and Individual Partnership - the pathway for students already enrolled in a Ph.D. program.

### New York University

Program Representative(s): Heather McKellar, PhD, Annette Gray, PhD, and Rachel Weintraub-Brevda, PhD

http://www.neuroscience.nyu.edu/

This integrated, multidisciplinary, neuroscience training program at New York University, prepares trainees for the intensely collaborative and innovative nature of modern neuroscience research. Over the last decade, we have reached a new phase of program integration that seamlessly merges neuroscience graduate education at NYU and offers far greater breadth and depth of training. Our program, which includes 104 training faculty, combines the strengths in systems, cognitive, and computational neuroscience from the Washington Square-based Center for Neural Science with those in cellular, molecular, developmental, translational, and clinical neuroscience at the NYU School of Medicine campus, and it serves as the foundation for the extensive neuroscience community at NYU. Our graduate program is highly competitive at the national level, proven by our recent success in recruiting outstanding graduate students as well as a number of new junior and senior faculty. The specific goals of our neuroscience training program are: (1) to provide a rigorous, high-quality, and broad-based graduate education in neuroscience within the context of an interactive, collegial, and cutting-edge research environment; (2) to foster a diverse and collaborative scientific culture through the recruitment of high caliber students, including active recruitment of underrepresented minorities; (3) to provide students with guidance of a rigorous mentoring system that ushers students through a series of milestones to a doctoral degree typically in 5-6 years; (4) to train students in necessary professional skills, including critical reading, grant writing, oral presentation, leadership, management, and networking; (5) to encourage a broad perspective on the field of neuroscience that encompasses basic, translational, and clinical research; and (6) to prepare students for the variety of scientific career opportunities that will be available to them after graduate school. We provide trainees with a vast and rich intellectual environment, as well as the resources and experience, to confidently pursue their own scientific interests and become independent scientific leaders, who will make future breakthroughs in basic, translational, and clinical neuroscience.

### **Oregon Health and Science University**

Neuroscience Graduate Program Representative(s): Jessica Parks-Piatt and Gary L. Westbrook, MD <u>https://www.ohsu.edu/xd/education/schools/school-of-medicine/academic-programs/neuroscience-graduate-program/</u>

The Vollum/OHSU Neuroscience Graduate Program (NGP), an interdepartmental program first developed at the Vollum Institute in the early 1990s now numbers approximately 50 students and 150 affiliated faculty. We are based at Oregon Health and Science University sitting on a hill overlooking downtown Portland. The Vollum Institute is well known for faculty expertise in cellular and molecular neuroscience, but the NGP faculty covers the full range of neuro-related scientific and clinical disciplines, and thus incoming Ph.D. students have a wide array of choices as they embark on a scientific career. For example, we have particularly strong faculty groups in structural biology and glial biology. NGP faculty members have appointments in the Vollum Institute, the Oregon Hearing Research Center (auditory neuroscience), the Jungers Center (disease-oriented neuroscience) as well as multiple centers and departments in the OHSU School of Medicine. The first year starts with a retreat on Mt. Hood in the Oregon Cascades followed by a bootcamp that covers both conceptual and hands-on technical skills. Thus incoming students have a chance to interact in an informal setting with students and faculty. Our core curriculum is unique in neuroscience consisting of a 12-week intensive course at the start of the first year followed by fulltime rotations so that students can quickly become proficient in laboratory research without time-sharing with classwork. We put emphasis on professional skill development and career planning through organized sessions and workshops, and our graduates have been successful in a wide range of science-related careers.

The Vollum Institute also offers a stipended **Summer Undergraduate Fellowship Program** that includes both coursework and internship in a neuroscience laboratory as well as a funded **1-year Postbaccalaureate Research Opportunity** designed to provide a transition for students wanted more research experience before pursuing graduate school in neuroscience. For more information, contact us at <u>ngp@ohsu.edu</u> or visit our website.

### **Princeton University**

Program Representative(s): Jamal Williams, Paula Brooks, Rolando Masis-Obando, Ed Clayton, PhD, and Ken Norman, PhD https://pni.princeton.edu/

Neuroscience research is becoming increasingly quantitative. Formal theoretical techniques are essential for understanding how complex, large-scale interactions between neurons give rise to thought and behavior. and advanced quantitative methods of data analysis are necessary for addressing the increasingly large, multidimensional data sets generated by modern brain imaging techniques (e.g., multiunit recording, fMRI). These methods are also necessary for future progress to be made in understanding, diagnosing, treating and, ultimately, curing brain disturbances that give rise to psychiatric disorders. Unfortunately, the mathematical and computational skills required to address these needs are not a focus of standard neuroscience curricula. Princeton's Quantitative Neuroscience Training Program (ONTP) is designed to address this need, by providing the next generation of neuroscientists with the necessary mathematical and computational skills for measuring, analyzing, and modeling brain function. The establishment of the QNTP has sparked several developments at Princeton, that (in turn) have accelerated the pace at which the goals of the QNTP are being met. By bringing Princeton's neuroscientists together with faculty in Physics, Mathematics, Computer Science and Engineering, the QNTP helped to spur the formation of the Princeton Neuroscience Institute (PNI) in 2005. The QNTP also helped to inspire the formation (in 2008) of PNI's new free-standing Ph.D. Program in Neuroscience, which incorporates a strong emphasis on classroom and laboratory training in basic quantitative and computational methods during its first two years. These new developments have made it possible for us to refocus the QNTP from its original purpose (providing a foundation in quantitative neuroscience for trainees who are starting out in this area) to providing advanced training in quantitative neuroscience. Specifically, we take the most quantitatively-focused subset of our predoctoral and postdoctoral trainees and provide them with the additional tools and training that they need to excel in computational neuroscience research. This training is accomplished via advanced quantitative and computational neuroscience elective courses that were developed for the QNTP and are taught by leaders in the field, as well as participation in research seminars, journal clubs, and retreats that are designed to deepen the trainees' knowledge and bolster community among the trainees. PNI faculty have made seminal contributions to quantitative neuroscience, ranging from information-theoretic analyses of neuronal spiking and nonlinear dynamical systems analysis of decision-making to multivariate decoding of human neuroimaging data. The QNTP has been specifically formulated to bring predoctoral and postdoctoral trainees into contact with this expertise and, through this, to catalyze their transformation into full-fledged computational neuroscientists.

### Stanford University School of Medicine

Program Representative(s): Anthony Ricci, PhD http://med.stanford.edu/neurogradprogram.html

The goals of the Stanford Neurosciences Program are to train Ph.D. students as leaders in neuroscience research and teaching. Our program continues to adapt to the ever-changing state of the art of the science as well as preparation required for the various roles to which our graduates aspire. Teaching students how to identify, approach and solve specific research problems will promote their professional development as independent scientists and will contribute new knowledge to the broad field of neuroscience and its application. Our student populations is the major strength of our program, a highly successful, highly interactive and supportive group of young investigators who are from diverse backgrounds, each bringing unique strengths to our community. The Program provides students with the opportunity to conduct cutting edge research in any of a broad range of disciplines including molecular and cell biology, genetics, biophysics, electrophysiology, anatomy, computational modeling, neuroimaging, technology development and the quantitative study of behavior. Formal course work is individualized to the needs and interests of each student. It requires students to integrate this knowledge across levels and to apply it to their specific research goals. The Program incorporates added depth and breadth via a suite of activities including a laboratory boot camp, retreats, seminar series, summer courses, and networking opportunities. All students will be enrolled in the Interdepartmental Program in Neuroscience, the only academic body at Stanford that awards a Ph.D. in the neurosciences. The training faculty is composed of 91 researchers from 22 departments in 3 schools. The faculty is highly interactive, intellectually diverse, and their research efforts well-funded. Trainees are required to rotate through three labs before committing to a preceptor. Course requirements must be fulfilled with courses taught by different academic departments, and the members of the examination and thesis committees must be from more than one department. The Program Committee, which is the governing body, is composed of Program faculty from eight departments, along with student representatives. Admissions and curriculum issues are handled by separate committees, each composed of similarly diverse faculty/student groups. Admitted students are among the most outstanding candidates in the nation. Past trainees of the Neurosciences Program have been extremely successful in pursuing leadership careers across multiple platforms.

### Temple University

Program Representative(s): Lisa Briand, PhD, and Ellen Unterwald, PhD http://www.temple.edu/neuroscience/

The Drugs of Abuse Training Program at Temple University School of Medicine provides individualized multidisciplinary training to predoctoral students and postdoctoral fellows who are dedicated to researching the neurobiology of addiction, the pharmacological effects of drugs of abuse, and the effects of drugs of abuse on the immune system including HIV infection. It is a basic science training program that provides intensive immersion in state-of-the-art approaches and techniques to address important issues in the substance abuse field. This Training Program is supported by a team of exceedingly talented faculty who are committed to training the next generation of substance abuse researchers. The faculty mentors are highly collaborative, and the trainees benefit from a dynamic interactive atmosphere. Although the home of the Training Program is in the Department of Pharmacology, the faculty mentors come from many disciplines

including neuroscience, microbiology and immunology, pathology, molecular biology, anatomy, cell biology, psychology, pharmaceutical sciences, and pharmacology, thus providing a multidisciplinary training environment. The faculty and trainees are brought together through the support of the Center for Substance Abuse Research which provides the infrastructure that nurtures research and training on the biological basis of addiction and other topics related to drugs of abuse. This provides the trainees with a rich environment in which to pursue substance abuse research. The Drugs of Abuse Training Program is organized around the needs of the trainees and includes didactic instruction through a set of core courses on the pharmacology of drugs of abuse; exposure to clinical aspects of substance abuse and addiction; a seminar series and journal club focused exclusively on drugs of abuse, addiction, and HIV/AIDS; an annual retreat; opportunities to develop oral and written communication skills; annual self-assessments and faculty evaluations of progress; training in ethical research practices; numerous career development activities; and immersion in laboratory approaches that range from molecular and cellular biology through behavioral pharmacology. The Drugs of Abuse Training Program reliably recruits outstanding trainees including individuals from diverse backgrounds and has a near perfect record of completion. The program has been successful in, and remains committed to, preparing pre- and postdoctoral trainees to become productive independent scientists in the substance abuse field.

### University of Alabama at Birmingham, Neuroscience Roadmap Scholars Program

Program Representative(s): Leland Fleming, Rylie Hightower, and Lori McMahon, PhD <u>https://www.uab.edu/medicine/rms/</u>

Although the number of U.S. citizens from underrepresented minority (URM) groups earning doctoral degrees in science has increased over the past decade, URMs continue to represent a small proportion of the scientists in the United States. UAB is uniquely positioned to support the training of diverse group of trainees. Evidence of this readiness is the significant (36%) undergraduate enrollment of URM students, predominantly African American, given our location in the Southeastern US. In addition, UAB is the home for several students with disabilities at the undergraduate and graduate levels (approximately 400). Importantly, there are several programs already in place, such as the Office of Equity and Diversity, the Comprehensive Neuroscience Center, and the focus on Neuroscience in the School of Medicine Strategic Plan serve as a firm footing for the development of a program targeting diversity in Neuroscience. The Comprehensive Neuroscience Center functions as the epicenter for the Neurosciences on UAB campus. The CNC has a membership of approximately 365 members, with faculty from 11 basic science and clinical departments from 5 Schools. Since 2010, 89 new faculty have been recruited across several neuroscience-related departments and the number of students from diverse backgrounds applying to the Neuroscience Theme graduate program represents 27% of the domestic applicant pool in 2014. The Neuroscience Roadmap Scholars Program targets the obstacles impeding success with the goal of attracting an increased number of diversity trainees to neuroscience research and providing them with the necessary tools and skills early in their Ph.D. careers which are essential to making this a life-long career choice. The specific "value added" components of the Neuroscience Roadmap Scholars Program include the annual southeast regional NEURAL (National Enhancement of UnderRepresented Academic Leaders) summer conference, interactions with Career Coaches (separate from the scholar's Research mentor), Peer-to peer mentoring and undergraduate mentees, and distinct extracurricular activities.

### University of California-Berkeley

Program Representative(s): Dan Feldman, PhD; Michael Silver, PhD; Candace Groskreutz <u>http://neuroscience.berkeley.edu/</u>

Our training program provides rigorous academic and research training and emphasizes multi-disciplinary approaches and new, emerging methods, with the goal of fueling paradigm shifts in how we study the brain. Our 48 training faculty are from 12 departments, and represent neuroscience research from molecules and genes, to cells and circuits, systems and computation, behavior and cognition. Our faculty is well-integrated, collaborative, and united under the Helen Wills Neuroscience Institute (HWNI), which is the intellectual center for neuroscience at UC Berkeley. This training program primarily supports Ph.D. students in the Neuroscience Ph.D. Program, which offers broad-based training in neuroscience research, and a smaller number of

students in 3 additional Ph.D. programs in our training faculty laboratories. All students receive the same broad-based neuroscience coursework, research, and professional skills training. Our program provides training across a wide range of neuroscience, from molecules to mind. We combine flexible coursework, rigorous research training, quantitative skills, and a major focus on advanced research methods. Our multi-disciplinary approach to neuroscience leverages Berkeley's deep expertise in molecular and cell biology, physical and computational sciences, engineering and psychology. We require broad-based neuroscience coursework, laboratory rotations and thesis research, an experimental Boot Camp course, and a Statistics/Quantitative Methods class. We provide substantial professional skills training and career advising. Seminar series, journal clubs, and an annual campus-wide retreat provide rich exposure to modern neuroscience research. A multi-tiered advising system provides extensive scientific and career advising. Our students conduct innovative research and publish in top journals. We have a solid track record in recruiting and graduating diverse Ph.D. students. The great majority of past trainees have gone on to productive careers in academic biomedical research and industry. Innovative new training elements will further prepare our students for cutting-edge research careers.

### University of California-Davis

Program Representative(s): W. Martin Usrey, PhD <u>https://neuroscience.ucdavis.edu/</u>

The goal of the Training Program in Basic Neuroscience is to provide a broad training in the fundamental principles of neuroscience for entering students that will lay solid foundations for their specialized research in advanced years. It also provides them with the broad perspective essential for their establishing successful independent research programs in neuroscience in their future careers. The program operates under the auspices of the interdisciplinary graduate program in neuroscience at UC Davis, which offers the scope and flexibility needed to meet our training objectives. Trainees participate in a teaching program especially designed to give exposure to as broad a range of modern neuroscience subdisciplines and technologies as possible including cellular and molecular neuroscience, neuroanatomy and neurophysiology, neurogenetics, systems neuroscience, cognitive neuroscience, computational neuroscience and, the neurobiology of psychiatric and neurological disease. Trainees receive a rigorous basic training through formal course work, seminars and journal clubs and laboratory rotations and participate in colloquia in which they are expected regularly to make oral presentations. Students will thus be well prepared for their dissertation research and for future, independent careers in basic and disease-related neuroscience research.

### University of California-San Diego

Program Representative(s): Amy Taylor and Bradley Voytek, PhD https://healthsciences.ucsd.edu/education/neurograd/Pages/default.aspx

The Neurosciences Graduate Program (NGP) at the University of California, San Diego (UCSD) is committed to training the next generation of neuroscience researchers, clinician-scientists and academicians. Over the past 20 years, the UCSD NGP has become one of the top neuroscience graduate programs in the country, ranked 4th in the nation in the 2010 National Research Council ranking. This training grant supports the first- and second-year students in the program, and is endorsed by strong institutional support from the participating departments at UCSD, the Salk Institute, The Scripps Research Institute and the Sanford-Burnham Medical Research Institute. These institutions are world-class research centers on the Torrey Pines Mesa, with the UCSD campus as the home academic institution. The NGP provides the broad umbrella that unites neuroscientists from all these institutions. The NGP provides trainees with a rich curriculum covering a broad spectrum of sub-disciplines in neurosciences, mentored research in the individual laboratories of outstanding investigators, and collaborative opportunities across different programs. The NGP responds to emerging areas of interest; a new formal specialization that expands the scope of training is Computational Neuroscience, added in the past few years. The NGP's training plan is structured such that the students form close interactions with each other and with the faculty upon entry to the program. Incoming students receive intensive hands-on laboratory training through the NGP Boot Camp, which also gives the students a unique bonding experience and initial exposure to the breadth of NGP research options. Following the core courses and three research lab rotations, students choose their dissertation thesis labs at the end of the first year.

Each student's progress is monitored through an integrated series of cohesive formal evaluations. All students take a required course for scientific conduct and ethics. Students are enriched through a variety of activities that facilitate and enhance the interactions between students and training faculty. Career advising and mentorship are in place at each successive year. Vertical interactions among students from different years are facilitated through journal club, research rounds, and a prestigious seminar series organized and run by the NGP students, and the annual recruitment and retreat activities. Recruitment and admission to NGP is highly competitive. The program makes dedicated efforts to improve the recruitment and retention of under-represented students; the NGP ranks the top in representation of URM population among the UCSD graduate programs for STEM (Science, Technology, Engineering and Math). The research productivity of the trainees is outstanding, and a large fraction of former trainees continue in scientific research and higher education. Over the next five years, the UCSD School of Medicine has set a goal to increase the size of the program through enhanced institutional support, with a strong commitment to improving the program's diversity.

#### University of Colorado School of Medicine

Program Representative(s): Diego Restrepo, PhD, and Deanne Sylvester <u>http://www.ucdenver.edu/academics/colleges/medicalschool/programs/Neuroscience/Pages/N</u> <u>euroscience.aspx</u>

The Neuroscience Training Program (NSP) at the University of Colorado, School of Medicine is an interdisciplinary Ph.D. granting degree started in 1986 that has been funded by a Jointly Sponsored Training Grant since 2001. The NSP has 60 faculty members. The faculty have an outstanding training record. Our graduates have a strong record of achievements as academicians and scientists. The average number of manuscripts published by our graduate students during their tenure was 3 manuscripts. The focus of the NSP is on training outstanding neuroscientists and academicians who will make significant contributions to neurobiology, become leaders in the field and impart these qualities to future generations of neuroscientists. In addition, we aim to foster development of students who approach research in a responsible, professional manner. In the last funding period, the NSP had its external review and acted quickly to put the reviewers' recommendations into practice. The Curriculum Committee, working in close collaboration with the Director, refined the curriculum designed to attain these goals. The emphasis of NSP is on fostering increasing independence, responsible conduct and critical thinking through courses and laboratory rotations in the first year of instruction so that, in the second year and beyond, we have students who think independently and develop, troubleshoot and communicate effectively the results of their own hypothesis-driven projects.

#### University of Iowa

Program Representative(s): Marco Pipoly and C. Andrew Frank, PhD <u>https://neuroscience.grad.uiowa.edu/</u>

The Neuroscience Graduate Training Program focuses on integrated, broad-based, fundamental, multidisciplinary predoctoral training in Neuroscience at the University of Iowa. The program builds on more than three decades of success in matriculating and training top-caliber students, on stable, mature leadership, and on a steady increase over the past ten years in the quality and depth of our applicant pool. The program is modest in size (48 current students) and stellar in quality, and draws on a long tradition of close interactions among scientists with primary appointments in basic and clinical departments, and their expertise in mentoring students, formally and by example, in the interplay between basic and clinical research. The training faculty are 44 extramurally-funded neuroscientists with research interests that span the gamut of neuroscience, from ion channels to consciousness. The preceptors have extensive experience and success training students. Students participate in a well-developed, mature curriculum that offers broad and fundamental training in neuroscience, spanning the breadth of the field in terms of levels of analysis (from molecules to integrated functional systems) and diversity of approaches (from patch clamp microelectrodes to human lesion-deficit and functional neuroimaging to translational research), with a special focus on the neuroscience of disease and disorders (including an NIH- supported Neurobiology of Disease course), extensive training in statistics and experimental design, and specific training in rigor, transparency, and reproducibility in science. The program incorporates three laboratory rotations, regular programmatic activities (lab meetings, seminars, journal clubs, retreats), and comprehensive, mandatory training in responsible conduct of research. The "value-added" feature of our program is especially compelling—major increases in the quantity and quality of applicants, matriculation and retention of students from diverse backgrounds, an outstanding time-to-degree of just over 5 years, a completion rate of over 80%, outstanding student publication records, and placement of graduates in prominent neuroscience-related academic positions. Our program remains committed to training a diverse and highly expert workforce of neuroscientists who will assume leadership roles related to the nation's biomedical and behavioral research agenda.

### University of Maryland School of Medicine

Program Representative(s): Georgia Rogers and Mary Kay Lobo, PhD <u>http://lifesciences.umaryland.edu/Neuroscience/</u>

The Program in Neuroscience (PIN) at the University of Maryland Baltimore provides contemporary predoctoral training with exceptional trainee outcomes in the discipline of neuroscience. Major objectives of the program include 1) continued development of innovative educational techniques that harness the power of portable computing (iPad Initiative) and the opportunities they offer for accessing knowledge, "flipped classrooms", visualization, presentation and communication, and 2) a well-honed Core Course curriculum that provides students with diverse educational backgrounds a deep knowledge of biological principals and critical thinking thereby building a platform for life-long learning and scientific discovery. Supplemented by a continuously up-dated menu of required and elective courses, recently including Translational Psychiatry, Behavioral Neuroscience and Biostatistics Flipped, this curriculum fulfills our long-term goal of producing students with enduring learning skills that foster creative thinking and flexible problem solving, equipping them with the capacity to meet future challenges and opportunities. Career development is enhanced by multiple mechanisms including: 1) PIN specific Proseminar in Hypothesis Testing and Experimental Design; 2) opportunity to minor in Pharmacology, 3) grant and scientific writing workshops, 4) extensive training in oral, presentation and interviewing skills and 5) multiple and varied enrichment activities with local scientists in government, pharmaceuticals, biotechnology and non-profit organizations. This training program provides the financial stability and organizational structure that frames the overall PIN, amplifying the impact of neuroscience in the larger Graduate Program in Life Sciences, the umbrella organization for PIN and seven other Ph.D. granting programs. Consistently successful recruitment has been stable for many years, combined with increasing numbers of TGE and URM applicants and a faculty that has competed exceptionally well for research funding in challenging times. The University of Maryland Baltimore is a professional campus in an urban setting with a long-standing commitment to graduate education with the strong support of the Schools of Medicine, Dentistry and Nursing as well as the Graduate School.

### University of Michigan

Program Representative(s): Audrey Seasholtz, PhD <u>http://neuroscience.med.umich.edu/</u>

The 'Early Stage Training in the Neurosciences' (ESTN) was founded at The University of Michigan (UM) in 2001 and serves as a centerpiece of the Neuroscience Graduate Program's (NGP) training. The ESTN goal is to support broad predoctoral training of exceptional researchers in neuroscience for careers that address the nation's basic science and biomedical research needs. To be eligible for ESTN support, students must gain admittance to the NGP, which is the most selective biomedical science department/program at the University of Michigan, through either direct or PIBS admission. The ESTN consists of 72 faculty representing 24 departments in 4 schools or colleges. The wide academic distribution, strong research funding and highlevel of peer recognition of the ESTN faculty excellently matches our focus on broad early stage training in neuroscience. In the first year, students complete a broad-based neuroscience curriculum that includes: neuroscience "boot camp", principles of neuroscience, human neuroanatomy, statistics, research rotations. ESTN trainees are exposed to a broad range of research areas including: Molecular and Cellular Neuroscience; Developmental Neuroscience; Sensory Neuroscience; Cognitive Neuroscience; Behavioral and Systems Neuroscience; Computational Neuroscience; and Clinical Neuroscience. During their second

year, students take elective courses, give a research seminar presentation, and begin work on their doctoral thesis. The NGP at University of Michigan is quite proud of its strong history of recruiting and training underrepresented minority students. The NGP organizes a growing number of specific activities towards the goal of improving graduate training of its students so as to create an interactive, supportive and cohesive neuroscience community that successfully facilitates intellectual and research-intensive training. In addition, it has mentored trainees in the importance of grant writing, which has led to considerable success in external research fellowships, and of oral scientific communication skills. Our goal is to facilitate training of the future leaders in neuroscience and to develop students that compete successfully in the scientific marketplace.

### University of Pennsylvania

Program Representative(s): Christine Clay, Kelly Jordan-Sciutto, PhD, and Joshua Gold, PhD <u>https://www.med.upenn.edu/ngg/</u>

The Training Program in Neuropsychopharmacology will train scientists who will carry out productive research in their individual fields effectively at the "preclinical-clinical" interface, and more effectively translate research from the laboratory to the bedside in mental health. This objective is addressed by having the Fellows attend specific courses and activities, by arranging for exposure of all non-physicians to clinicians and by facilitating interactions between preclinical and clinical investigators. The didactic portion of the Program comprises about 15% of a Fellow's time; most of their time is spent doing research in the facilities of one or more of the 29 faculty members of the Training Program. The approaches and expertise of the faculty are broad and diverse, and enable us to provide training at the molecular, cellular, neuroanatomical, animal behavioral and/or clinical level. The program currently supports four postdoctoral and two predoctoral Fellows yearly. Postdoctoral Fellows in the Program will be either (1) students with doctoral degrees in pharmacology, psychology, psychobiology or a related discipline, or (2) physicians who have completed at least three years of specialist training in psychiatry or, in selected instances, other specialty areas (e.g., pediatrics, neurology). One of the postdoctoral slots is targeted preferentially to a physician-scientist. Predoctoral fellows will be graduates of a four-year program in biology, chemistry, psychology or a related discipline; upon successful completion of the program, they will receive a doctoral degree in pharmacology or neuroscience. The multidisciplinary program involves faculty from six departments in the School of Medicine as well as faculty from the Schools of Veterinary Medicine and Arts and Sciences. The faculty members of the Training Program have a history of collaboration in both teaching and research projects, and could easily accommodate co-mentoring arrangements between physicians and non-physicians. The predoctoral Fellows are advanced graduate students in pharmacology or neuroscience and take a series of courses designed to provide them with background in the anatomical, biochemical and physiological bases of pharmacology, with an emphasis on neuropsychopharmacology. Specific courses taught by Training Program faculty and other activities have been developed that emphasize the consideration of clinical practice in psychiatry in the conduct of basic research related to behavior.

### University of Texas Health Science Center at San Antonio

Program Representative(s): David Morilak, PhD http://uthscsa.edu/neuroscience/

The Neuroscience Program at UTHSCSA provides didactic and laboratory training in a range of subject areas and levels of analysis from molecular, cellular, and neurochemical to systems, behavioral, and clinical, all focused on the regulation and function of the nervous system. Drawing on the expertise of approximately 50 faculty from 5 basic science departments and 8 affiliated departments or divisions within the medical and dental schools, we emphasize a flexible program of study and research tailored to the individual needs and interests of all students in Neuroscience. In addition to track-specific fundamental and elective courses, we offer a rich diversity of research rotation opportunities, upper-level elective courses, and a broad selection of faculty dedicated to mentoring graduate students in dissertation research. In addition, Neuroscience students will enjoy a number of enrichment opportunities, including journal clubs, seminars, an annual retreat, participation in brain awareness week activities, and several social functions. Students are encouraged to present their research in a variety of settings, to attend professional meetings locally, nationally and even internationally, and to publish their work in peer-reviewed professional journals. Our

program is the recipient of a Neuroscience T32 training grant. A highly interactive community of faculty, postdoctoral fellows, laboratory staff and fellow students all contribute to a challenging, stimulating and supportive environment within which our students can develop into successful neuroscientists.

### University of Utah

Program Representative(s): Christopher Gregg, PhD <u>http://neuroscience.med.utah.edu/</u>

Research in neuroscience has become increasingly interdisciplinary; it is not possible to understand the nervous system by focusing on a narrow area of expertise. The principle underlying the graduate education offered by the University of Utah Interdepartmental Program in Neuroscience is that students are given the tools to study a problem from a very broad perspective. This includes the application of diverse approaches that include classical embryology, molecular biology, electrophysiology, behavior, and pathology. Our program offers training in three fundamental areas critical for successful research science careers: didactic training in all areas of neuroscience, research opportunities in diverse areas supervised by outstanding mentors, and multifaceted career skill development throughout the training period. 74 graduate program faculty members from 19 participating departments are aligned in five specific areas of expertise: neurobiology of disease, molecular neuroscience, cellular neuroscience, brain and behavior, and developmental neurobiology. These five areas reflect the breadth of the graduate program and provide exceptional opportunities to the 49 current students. 37 outstanding faculty members, chosen from this group based on research productivity, funding, and mentoring skill, participate in the T32 training program. Our former T32 trainees, the first of whom received their Ph.D. in 2011, have been remarkably productive and have obtained postdoctoral fellowships at Harvard, Columbia, HHMI/Janelia Farm, and UT Southwestern. There is no doubt that many of them, as well as future trainees, will become leaders in neuroscience research.

### University of Washington School of Medicine

Program Representative(s): Jane Sullivan, PhD http://depts.washington.edu/neurogrd/

The Graduate Program in Neuroscience, established at the University of Washington in 1996, comprises 48 students and 141 faculty members from 27 departments and 4 partner institutions across the city of Seattle. Our goal is to train the best neuroscientists possible, fostered by inclusion of students from diverse and underrepresented backgrounds. We have exceptional breadth and depth of research interests, including neurodevelopment, neurodegeneration, addiction, ion channel physiology and pathology, systems neuroscience, and computational neuroscience. The breadth of our faculty allows us to provide interdisciplinary training drawing from a variety of techniques and approaches, including neuroanatomy, biochemistry, molecular biology, physiology, biophysics, pharmacology, in vivo brain imaging, computational modeling and behavior. In addition to a solid core of required and elective courses, students also receive instruction in other key areas of professional development on topics including grant writing, public speaking and bioethics. Faculty mentors and the Graduate Training Committee closely monitor student progress to ensure that each student receives the guidance he or she needs to succeed. Graduates emerge from the program prepared to conduct independent research and equipped to pursue a variety of career paths. One of the primary attractions of our program is that it accommodates students with diverse academic backgrounds, and offers a wide selection of faculty with whom to work. By supporting early-stage students while they remain substantially engaged in important components of their training outside their dissertation labs, this training grant will give our students greater independence and control at a critical stage of their graduate careers, and make a significant contribution to the continuing success of graduate training in neuroscience at the University of Washington.

### Vanderbilt University

Program Representative(s): Danny G. Winder, PhD <u>https://as.vanderbilt.edu/neuroscience/</u>

This training program at Vanderbilt University is structured to support the early phases of neuroscience predoctoral education and training. In support of the overall NIH mission, the overarching objective of the program is to provide an exceptional training environment for the next generation of neuroscientists, and is built on the foundation of a strong training faculty with exceptional records of scholarship, research support and graduate mentoring. The heart of this mission is expressed in the academic and research goals of the program, which are to provide our students with a strong didactic foundation in the neurosciences through our core curriculum offerings, and to provide them with the opportunity to carry out state-of-the-art neuroscience research in the laboratories of a group of highly successful and committed mentors. In addition, the program has strong emphases on professional development and diversity, with the objective of building the requisite skills needed for success in graduate school and beyond, and of training an inclusive cadre of future independent investigators in neuroscience research. The Neuroscience Graduate Program at Vanderbilt is an interdisciplinary program that encompasses four different colleges and schools and 18 departments. Students can enter the program either directly or via three umbrella "feeder" programs (IGP/MSTP/CPB). Traditional and emerging areas of research strength in the program include: attention, brain evolution, cell signaling, cognitive neuroscience, circadian function, CNS drug development, development and developmental disabilities, molecular genetics, neurodegeneration and neurotoxicity, neuroimaging, plasticity, psychiatric illness, sensory and multisensory systems, synaptic transmission, and vision.

#### Wake Forest University Health Sciences

Program Representative(s): Carol Milligan, PhD http://neuroscience.graduate.wfu.edu/

Our training program is based on the belief that neuroscience broadly conceived provides a fundamental framework for understanding the biological basis of behavior and is critical for revealing the causes of neurological and psychiatric disorders. Accordingly, our major goal is to train students to be able to carry out meaningful and significant research in all areas of modern neuroscience and to give them an appreciation of the importance of all levels of organization, from genetics and molecular approaches to behavioral and physiological aspects, with an understanding of how basic neuroscience research is key to finding treatments for neurobehavioral pathologies and translating this information to the clinic. We hope to encourage and prepare students to take advantage of new research areas and to use a variety of methodologies throughout their research careers. Students should be prepared to use whatever conceptual and methodological approaches are most appropriate for pursuing promising new areas of research. This requires that students be trained to appreciate a research setting in which collaborations and interactions among investigators using different techniques and approaches is commonplace. We are strongly committed to our students' career development. A unique aspect of our program is that we provide several opportunities for our students to provide them with a strong arsenal of training and experience to make them competitive for the increasing opportunities for both non-academic and non-research careers that utilize their scientific and scholarly training. We believe that the training program, resources and environment provided by the Neuroscience Program at Wake Forest University accomplishes all of these goals.

### Washington University in St. Louis

Program Representative(s): Tamara Hershey, PhD, and Erik Herzog, PhD <u>http://neuroscience.wustl.edu/</u>

Washington University in St. Louis has a long tradition of excellence in the neurosciences. Here, Erlanger first measured nerve conduction velocity and its relation to axon diameter. In the 1950s, Levi-Montalcini, Cohen and Hamburger discovered the first neuronal trophic factor, nerve growth factor. Today, a large and interactive faculty focuses interest on almost every area of modern neuroscience ranging from molecular analysis of ion channels to positron emission tomography of the human brain.

Over 150 faculty from the departments of Neuroscience, Anesthesiology, Biochemistry and Molecular Biophysics, Biology, Biomedical Engineering, Cell Biology and Physiology, Developmental Biology, Genetics, Molecular Microbiology, Neurology, Neurosurgery, Ophthalmology and Visual Sciences, Pathology and Immunology, Physics, Psychiatry, Psychological & Brain Sciences, and Radiology serve as advisers for thesis research and serve as teaching faculty in the neurosciences. Training pathways with federal support including the genetics of psychiatric diseases, modern methods in systems neural science, translating discoveries from bench to bedside and back, imaging sciences, and biotechnology entrepreneurship provide additional, specialized training within the Neuroscience Program. The remarkable breadth of faculty interests in neuroscience at Washington University guarantees a student's exposure to a wide range of current neurobiological problems and approaches.

### Yale University

Program Representative(s): Charles Greer, PhD, and Michael Crair, PhD <u>http://medicine.yale.edu/inp/</u>

The Interdepartmental Neuroscience Program (INP) is Yale's university-wide interdepartmental doctoral program, currently in its 29th year. The faculty of the INP's T32 Jointly Sponsored NIH Predoctoral Training Program includes over 100 neuroscientists from departments of the Faculty of Arts and Sciences (FAS) and the Yale Medical School (YMS). Students are admitted through a neuroscience admissions committee that is part of the Biological and Biomedical Sciences (BBS) program of Yale. Upon affiliating with the INP the students remain within the interdepartmental program through their graduation. The INP is actively involved in educating students from underrepresented ethnic and/or racial groups. Since 2010 11% of the US/permanent resident neuroscience students in the program were from these groups. All INP students take four core graduate classes in neuroscience and bioethics, three advanced course electives, and two 1st year research rotations. They attend invited seminars, research in progress talks, an annual retreat and attend the Society for Neuroscience meeting at the program's expense. In the 2nd year the students select a doctoral adviser from the pool of participating faculty. They also take the doctoral qualifier examination, which has tutorial, written, and oral components. The students advance to candidacy for the Ph.D. upon defending a prospectus in the 3rd year. All students are provided travel funds to attend and present their work at national meetings. A Ph.D. in Neuroscience is awarded to graduates by the INP. Our students and alumni develop rational approaches to understand the outstanding problems in nervous system function, and through their research advance practical solutions for the disorders of the nervous system that afflict society.

## MENTORING RESOURCES

### "MENTOR: SOMEONE WHOSE HINDSIGHT CAN BECOME YOUR FORESIGHT"

Look for mentoring articles on SfN Neuronline <u>http://neuronline.sfn.org/Career-Specific-Topics/Professional-Development</u>

How to Get the Mentoring You Want: A Guide for Graduate Students at a Diverse University <u>http://www.rackham.umich.edu/downloads/publications/mentoring.pdf</u>

Making the Right Moves and Training Scientists to Make the Right Moves <u>http://www.hhmi.org/programs/resources-early-career-scientist-development</u>

Individual Development Plan (IDP), a Web-based career-planning tool created to help graduate students and postdocs in the sciences define and pursue their career goals <a href="http://myidp.sciencecareers.org/">http://myidp.sciencecareers.org/</a>

National Research Mentoring Network <a href="https://nrmnet.net/">https://nrmnet.net/</a>

Mentoring Compacts: Example compacts for download are available at <u>https://ictr.wisc.edu/mentoring/mentoring-</u> <u>compactscontracts-examples/</u>

## **PROFESSIONAL CONFERENCES**

Venues for professional development activities, scientific presentations and networking opportunities with diverse peers, faculty and academic biomedical research Institutions

Association of American Indian Physicians (AAIP)

Annual Biomedical Research Conference for Minority Students (ABRCMS)

Association of Minority Health Professions Schools, Inc. (AMHPS)

Hispanic Association of Colleges and Universities (HACU)

Society for the Advancement of Chicanos and Native Americans in Science (SACNAS)

Neuroscience Scholars Program (NSP) at Society for Neuroscience

## ENDURE TRAINEE INFORMATION AND RESEARCH ABSTRACTS

## BUILDING RESEARCH ACHIEVEMENT IN NEUROSCIENCE (BRAIN)

#### UNIVERSITY OF COLORADO DENVER

Principal Investigator: *Dr. Diego Restrepo* - University of Colorado Denver Principal Investigator: *Dr. Barbara Lyons* – New Mexico State University Principal Investigator: *Dr. Sondra Bland* – University of Colorado Denver Downtown Campus Partner Institution: New Mexico State University

### PROGRAM DESCRIPTION:

Student training through institutional partnerships will bridge the neuroscience research participation gap by preparing diverse undergraduates in the Rocky Mountain and Southwest Region for successful entry to neuroscience Ph.D. programs.

BRAiN unites preexisting formal research and education programs at diverse institutions: the Neuroscience Graduate Program at the University of Colorado Denver in the Anschutz Medical Campus (NSP at UCD-AMC), home to a T32 Neuroscience Training Grant; the RISE to Excellence biomedical research education program at New Mexico State University (NMSU), a Hispanic serving minority institution; and the undergraduate Brain and Behavior program of the Department of Psychology at the University of Colorado Denver downtown campus (UCD-DT). BRAiN aspires to expand through developmental partnerships with Colorado State University- Pueblo and other colleges in the region.

Broad participation in the Ph.D. neuroscience/behavior pipeline will be enabled through pursuit of three specific aims: (1) recruitment of 67 BRAiN Scholars from diverse demographic groups that are nationally underrepresented in biomedical and behavioral neuroscience research; (2) development of the neuroscience/ehavior research expertise and professional skills of BRAiN Scholars; (3) retention of BRAiN Scholars in neuroscience/behavior research through enrollment in postgraduate programs.

BRAiN will provide intensive training that combines mentored independent research with student development of a rich knowledge base in neuroscience core concepts. Curriculum integration will be achieved through a common Neuroscience Seminar Series and a Neuroscience Core Course. Emphasis will be placed on enhancement of mentorship skills through activities such as the Neuroscience Mentor Academy where faculty will meet to discuss student training, program evaluation, and curriculum reform. Taken together, proposed activities will provide an integrated research and professional development experience across multiple sites that leverages 21st century resources for scientific investigation and is responsive to practical aspects of contemporary student life.

### ADDITIONAL PROGRAM TEAM MEMBERS:

Dr. Elba Serrano – New Mexico State University Dr. Ernesto Salcedo – University of Colorado Denver Anschutz Medical Campus Isaac del Rio – Research Education Facilitator, New Mexico State University

## SHAWN D'SOUZA

Home Institution and State: University of Colorado Boulder, CO Email: shds5856@colorado.edu Undergraduate Academic Level: Senior Undergraduate Major and Expected Graduation Date: Molecular, Cellular, and Developmental Biology; Neuroscience, May 2019 Mentors/Advisors at Home Institution:

### **ENDURE Trainee Scientific Interest:**

My research interests are clinically based. I focus mainly on neurosurgery and neuroimaging techniques in hopes of progressing the field and surgical technique. Currently, I am working on the capabilities of Diffusion Tensor Imaging in describing glioma effect on white matter tractography.

### ENDURE Trainee Career Goals and Plan:

I am currently applying to M.D./Ph.D. and M.D. programs. I am working towards becoming a neurosurgeon and will continue to conduct neurosurgical clinical research throughout my medical school and professional careers.

## **ENDURE Trainee Summer Research Experience:**

ENDURE Summer Research Experience Institution: University of Colorado Denver Anschutz Medical Campus

Mentors/Advisors at ENDURE Summer Research Experience Institution: John Thompson, PhD

# ENDURE Research Project Title: Analysis of diffusion tensor imaging tractography indicates focal impact of glioma on white matter pathways

Background: Gliomas account for 26.5% of all primary CNS tumors. DTI analysis has become widely utilized to study glioma impact on white matter tractography (WMT) in vivo, however, few studies have used along-tract-analysis to explore the impact tumor proximity has on WM integrity.

Methods: This study retrospectively analyzed 13 preoperative T2 FLAIR and DTI scans of patients containing either high or low-grade gliomas. Deterministic streamline fiber tracking was done to find the corticospinal tract and superior longitudinal fasciculus pathways of the tumor and non-tumor hemispheres. FA map, track length, fractional anisotropy (FA), axial diffusivity (AD), mean diffusivity (M.D.), and radial diffusivity (RD) measures were collected for subsequent analyses.

Results: Diffusion metrics showed higher levels of white matter degradation in the tumor hemisphere. Along-tract-analyses revealed tracts only traversing the tumor region show significant white matter degradation compared to non-tumor hemisphere WM and tumor exclusive WM.

Conclusion: The results indicate the use of DTI as a pathophysiological tool to study glioma effects on white matter. Results demonstrate that gliomas have a localized effect, degrading WMT which cross the tumor ROI. Extent of effect of glioma on specific diffusion metrics vary and is an area of future study.

## AMI HAAS

Home Institution and State: University of Colorado Denver, CO Email: ami.haas@ucdenver.edu Undergraduate Academic Level: Senior Undergraduate Major and Expected Graduation Date: Integrative Biology, May 2019 Mentors/Advisors at Home Institution: Sondra Bland, PhD

### **ENDURE Trainee Scientific Interest:**

My original interest in neuroscience was sparked because of my parent's disabilities. Both of my parents have been completely blind since birth, and my mom is partially deaf as well. Watching them struggle my whole life makes me wish that I could help them, or at least others like them. I am very interested in studying visual development and visual perception. The BRAiN program has given me an opportunity to intern in a lab studying retinal development, which is especially interesting to me since my mom is blind due to retinoblastoma, which is cancer of the retina.

### **ENDURE Trainee Career Goals and Plan:**

Upon completing my undergraduate education, I plan to obtain my Ph.D. in Neuroscience from a top research university. I am especially interested in studying sensory systems, but visual perception is the area that intrigues me the most. Teaching and outreach are some of my lifelong goals. I could see myself doing research and teaching as a faculty member at a university for the rest of my life. I would also love opportunities to travel to new places and working as a faculty member would provide me with the chance to collaborate and network with people all over the country.

## **ENDURE Trainee Summer Research Experience:**

ENDURE Summer Research Experience Institution: University of Colorado Denver Anschutz Medical Campus

Mentors/Advisors at ENDURE Summer Research Experience Institution: Joseph Brzezinski, PhD

# ENDURE Research Project Title: Examining Potential Enhancer Regions for Known Cell Fate Specification Genes in the Murine Retina

Photoreceptor cells are essential to visual function, but how these cells develop is only partially understood. Photoreceptors are derived from multipotent retinal progenitor cells. Several transcription factors that control photoreceptor development have already been identified. To better understand their development, we are dissecting the gene regulatory networks governing photoreceptor differentiation. We searched for novel enhancers that control gene expression as progenitors adopt photoreceptor fate. We focused on two bHLH (basic helix-loop-helix) transcription factors, Ascl1 and Neurog2, whose expression precedes photoreceptor formation. We identified candidate enhancers based on ATAC-seq (Assay for Transposase Accessible Chromatin using sequencing) data from embryonic retina and DNA sequence conservation. To test these candidates, the region of interest was inserted into a plasmid that drives Green Fluorescent Protein (GFP) expression. Embryonic mouse retinal explants were electroporated with this plasmid, along with another plasmid that ubiquitously expresses nuclear cherry to mark transfected cells. The retinas were then fixed, sectioned, and stained with different antibodies to measure enhancer expression. We identified potential enhancers for both Ascl1 and Neurog2. We are currently dissecting these elements further to evaluate their spatial and temporal specificity. Understanding how these bHLH factors are regulated will help us understand the steps involved in photoreceptor development.

## JENNIFER LIBBY

Home Institution and State: University of Colorado Denver, CO Email: jennifer.libby@ucdenver.edu Undergraduate Academic Level: Junior Undergraduate Major and Expected Graduation Date: Psychology, December 2019 Mentors/Advisors at Home Institution: Achim Klug, PhD, Sondra Bland, PhD, Ernesto Salcedo, PhD, and Diego Restrepo, PhD

## **ENDURE Trainee Scientific Interest:**

I am interested in identifying how auditory processing affects the acquisition of phonemic awareness. Genetically, scientists have discovered there are genes that affect both auditory processing and dyslexia, a disorder in the development of phonemic awareness. I am interested in the neuron differences that are potentially present in individuals with a mutation of this gene.

### **ENDURE Trainee Career Goals and Plan:**

I am interested in pursuing a Ph.D. in Neuroscience in hopes that I will eventually have my own lab and able to teach our up and rising neuroscientists.

## **ENDURE Trainee Summer Research Experience:**

ENDURE Summer Research Experience Institution: University of Colorado Denver Anschutz Medical Campus

Mentors/Advisors at ENDURE Summer Research Experience Institution: Achim Klug, PhD, Elizabeth McCullagh, PhD, Ernesto Salcedo, PhD, and Elba Serrano, PhD

ENDURE Research Project Title: Alterations in the sound localization pathway in fragile X syndrome knock out mice

Fragile X Syndrome (FXS) is the most common monogenetic cause of autism, affecting synaptic connectivity and the correct development of brain circuits. The main sensory deficits reported by FXS patients are auditory, related to sound localization problems. These deficits point to the sound localization pathway in the auditory brain stem. Using an FMR1 knock out mouse line, we found that anatomically afferent inhibition to the medial nucleus of the trapezoidal body (MNTB) is downregulated in FXS mice, with GABAergic inhibition downregulated to the low frequency areas of MNTB, and glycinergic inhibition downregulated to the low frequency areas of MNTB, and glycinergic inhibition downregulated to the high frequency areas, suggesting frequency contour specific alterations in FXS. Since sound localization requires a delicate balance of excitation and inhibition, any alterations in this balance likely leads to decreased localization abilities, and decreased functioning in acoustically complex situations. Using in-vitro physiology, we are verifying these anatomical alterations. Specifically, patch clamp recordings from MNTB neurons will reveal whether downregulated synaptic bouton size and/or number will lead to decreased synaptic currents. Findings from these studies are critical for understanding the physiology behind the anatomical changes and ultimately will lead us to a better understanding of how these changes lead to altered sound perception in people with FXS.

## **GABRIEL MARTINEZ**

Home Institution and State: University of Colorado Denver Anschutz Medical Campus, CO Email: Gabriel.martinezsanchez@ucdenver.edu Undergraduate Academic Level: Senior Undergraduate Major and Expected Graduation Date: Bioengineering, May 2019 Mentors/Advisors at Home Institution: Emily Gibson, PhD

## **ENDURE Trainee Scientific Interest:**

My passion revolves around creating a system that can be utilized to study the human body, especially the nervous system. By analyzing the brain, we can have a deeper understanding of diseases and have a more successful approach to curing them. To successfully analyze the central nervous system, we must develop systems that can accurately and efficiently interpret data obtained from experiments performed. My interest peaks in the field of neuro-photonics and the ability to create programs and systems related to microscopes to examine the nervous tissue.

### ENDURE Trainee Career Goals and Plan:

My future consists of graduate school in a bioengineering program. I aspire to achieve a doctorate degree working in a neuro-photonics lab at the University of Colorado - Anschutz Medical Campus. Moreover, I look forward to working with my peers on complex systems to create devices as well as publishing papers on multiple, successful projects. Lastly, upon receiving my doctoral degree, I will pursue a career in industry in order to gain experience before I become a professor.

## **ENDURE Trainee Summer Research Experience:**

ENDURE Summer Research Experience Institution: University of Colorado Denver Anschutz Medical Campus

Mentors/Advisors at ENDURE Summer Research Experience Institution: Emily Gibson, PhD

ENDURE Research Project Title: Optimizing an Electrowetting Lens Driver Using Rapid Modulation for Multi-Plane Scanning Microscopy

Electrowetting technology allows for variable focus by manipulating a liquid-liquid interface. Electrowetting lenses are ideal for fiber-coupled microscopes for their simplicity, small size, and robustness. Our optical setup was limited to manually changing the focal plane for the sample being observed, but the addition of electrowetting technology corrected the issue. We constructed a fast-modulation driver for an electrowetting lens which allowed for multi-plane scanning microscopy. Arduino circuitry and computer programming were used to send instructions to the HV892 driving chip to control the electrowetting lens. Computer-aided design was used to build a 3D printed enclosure for the driver that served as a control box. The control box was implemented into a movable objective microscope where pollen samples were examined in two different focal planes at 6Hz and 10 Hz imaging speeds. The driver successfully allowed for different plane focus and demonstrated a long focal range of 650 µm between two pollen samples. After successful implementation of the electrowetting lens driver, more advanced 3D imaging such as volumetric resonance scanning, and tilted field-of-view scanning can be performed using a two-photon fiber-coupled microscope.

## LAURAINE MEDIAVILLO

Home Institution and State: New Mexico State University, NM Email: Imedia@nmsu.edu Undergraduate Academic Level: Junior Undergraduate Major and Expected Graduation Date: Biochemistry, Spring 2020 Mentors/Advisors at Home Institution: Erik Yukl, PhD

## **ENDURE Trainee Scientific Interest:**

My scientific interests include understanding the connection between bacteria and the nervous system. I am particularly interested in exploring how the gut microbiome impacts mental health by analyzing its association with psychiatric disorders. Furthermore, I aim to characterize the difference between beneficial and detrimental microbes and how they contribute to the development of behavioral/neuropsychological disorders.

## ENDURE Trainee Career Goals and Plan:

Upon completion of my undergraduate degree in biochemistry, I intend to enroll in a neuroscience Ph.D. program focusing on behavioral studies.

## **ENDURE Trainee Summer Research Experience:**

ENDURE Summer Research Experience Institution: University of Colorado Denver Anschutz Medical Campus

Mentors/Advisors at ENDURE Summer Research Experience Institution: Diego Restrepo, PhD and Daniel Ramirez-Gordillo, PhD

# ENDURE Research Project Title: Partial loss of CaMKII delays the ability of mice to learn to discriminate odors in a focused go-no-go olfactory discrimination

Schizophrenia is a neuropsychiatric disorder characterized by impaired concentration, working memory and social dysfunction. Environment and genetics play a role in its development. The alpha-isoform of calcium/calmodulin-dependent protein kinase II (alpha-CaMKII) is expressed in the brain and it is important in long term potentiation and memory. Heterozygous CaMKII knockout mice show schizophrenia-related phenotype including immature dentate gyrus (DG), hyperactivity and working memory deficits. To further investigate the role of CaMKII, we used an olfactory discrimination task to assess cognitive learning deficits and awake behave recording to measure changes in the neuronal oscillations in hippocampus and prefrontal cortex. Mice learned to associate one of the two odorants with water reward. Subsequently, WT, Het, and KO mice received double tetrode implants aimed at the CA1 region of hippocampus and medial prefrontal cortex. All mice learned to differentiate between the odor pair. However, when the odor pair was reversed, Het mice took longer to learn the task. Furthermore, there was an increase in activity for the rewarded odorant in the prefrontal cortex and hippocampus. Initial results indicate development of phase amplitude coupling between theta and gamma. These observations suggest a key role of CaMKII in associative learning and the development of fronto-hippocampal circuitry.

## **KARLY MILLER**

Home Institution and State: New Mexico State University, NM Email: kmills15@nmsu.edu Undergraduate Academic Level: Senior Undergraduate Major and Expected Graduation Date: Genetics and Biotechnology, May 2019 Mentors/Advisors at Home Institution: Brad Shuster, PhD

## **ENDURE Trainee Scientific Interest:**

I am heavily interested in developmental research, particularly that of the brain and related nervous system. I believe that by studying certain mechanisms in a developing brain, you could find answers to problems happening in the aging or damaged brain. I am very interested in the future of 3D-printing and regenerative medicine, and what those mixed together could do to advance medicine as we know it. Particularly, I am interested in an organoid model for Alzheimer's or Parkinson's disease to see if there are extreme differences compared to traditional tissue culture or mouse models.

## ENDURE Trainee Career Goals and Plan:

I plan on graduating in May 2019 and enrolling into a Ph.D. program in either Neuroscience or Biomedical Engineering studying neurodegenerative diseases. Eventually I would like to be able to continue doing research as a senior lab member, or possibly a Pl. I am also interested in writing for scientific journals or websites as a blogger or article reviews, as I believe strongly in educating the general public about scientific advancements and accomplishments.

## **ENDURE Trainee Summer Research Experience:**

ENDURE Summer Research Experience Institution: University of Colorado Denver Anschutz Medical Campus

Mentors/Advisors at ENDURE Summer Research Experience Institution: Curt Freed, MD

# ENDURE Research Project Title: Effects of phospho-Tau Mutations on Neuron Survival After Oxidative Stress Treatment

Alzheimer's disease (AD) is characterized by large populations of neurons dying in regions of the brain closely associated with memory and learning. At the cellular level, AD is caused by accumulation of toxic proteins in neurons that eventually undergo apoptosis. ß-amyloid protein forms extracellular plaques around neurons and is common in aging populations not associated with dementia. However, the degree of ß-amyloid deposition does not correlate with the severity of memory deficits, hence a growing interest in microtubule-associated protein tau (MAP-Tau). MAP-Tau accumulates within neurons forming neurofibrillary tangles, and greater accumulation of these tangles does correlate with worse cognitive decline in AD. When neurons are exposed to oxidative stress, tau becomes hyper-phosphorylated and is no longer able to bind microtubules, resulting in loss of transport along axons leading to impaired neurite growth and, ultimately, death. We created a cell line from rat-derived dopaminergic neurons (N27A) that overexpresses an AD-associated human mutant tau gene (P301L). Images using immunohistochemical staining show that mutant cells have hyper-phosphorylated MAP-Tau protein in tightly clustered, intracellular aggregates modeling AD. Preliminary results from oxidative stress treatments suggest that mutant cells are more susceptible to hydrogen peroxide-induced cell death in comparison with cells not transfected with mutant MAP-Tau.

## FELICIA RODRIGUEZ

Home Institution and State: New Mexico State University, NM Email: felerod@nmsu.edu Undergraduate Academic Level: Junior Undergraduate Major and Expected Graduation Date: Chemical Engineering, May 2020 Mentors/Advisors at Home Institution: Feifei Li, PhD

## **ENDURE Trainee Scientific Interest:**

As an engineering student, I am motivated to solve problems, which is why I have always been drawn to the mysteries behind neurological diseases. I have many research interests, but at the core, I would like to participate in translatable research that can be directly applied to individuals currently suffering from diseases. I am particularly interested in the development and application of drug delivery systems, tissue engineering, regenerative medicine, and biosensors.

### ENDURE Trainee Career Goals and Plan:

I will be graduating in May 2020 with my bachelor's degree in chemical engineering and minors in biomedical engineering and biochemistry. I intend to apply to Ph.D. graduate programs Fall of 2019 in neuroscience, neural engineering, and biomedical engineering programs. As a long term goal, I want to work in research and development of bioengineered treatments to neurological diseases. It is important to me that I produce devices/procedures that can be used to help individuals suffering from neurological diseases.

## **ENDURE Trainee Summer Research Experience:**

ENDURE Summer Research Experience Institution: University of Colorado Denver Anschutz Medical Campus

Mentors/Advisors at ENDURE Summer Research Experience Institution: Thomas Finger, PhD

ENDURE Research Project Title: Direct Structural Comparison of Type II and Type III Taste Cells

The taste system promotes intake of nutrients while ensuring avoidance of toxins. Taste buds detect taste substances and transmit information to nerves conveying the signal to the brain. Each taste bud comprises 50-100 taste cells divisible into three types: Type I are supporting and glial-like. Type II transduce sweet, bitter, or umami taste stimuli and rely on non-conventional synapses with ATP as a neurotransmitter from large, specialized mitochondria. Type III cells transduce sour and some salty tastes and possess a classical synapse with synaptic vesicles. Whether different nerve fibers connect to Type II or Type III cells is important for understanding taste coding. To address this, we used Serial Blockface Scanning Electron Microscopy (SEM) along with Reconstruct software to develop a clear distinction between the morphology of Type II and Type III. Since single EM images can be difficult to interpret correctly, it is important to compare multiple morphological features to classify cell types. We found that Type II and Type III cells can be identified using 4 morphological characteristics: nuclear shape, cytoplasmic density, microvillar structure, and nerve fiber contacts. Unambiguous identification of cell types will allow us to generate a taste bud connection map.

## MICHAEL TITUS

Home Institution and State: University of Colorado Colorado Springs, CO Email: mtitus@uccs.edu Undergraduate Academic Level: Senior Undergraduate Major and Expected Graduation Date: Biology, May 2019 Mentors/Advisors at Home Institution: Matthew Taliaferro, PhD

## **ENDURE Trainee Scientific Interest:**

I am interested in studying neuroscience at a molecular genetics level. I have been researching for the last two years and would like to continue forward as a career.

### ENDURE Trainee Career Goals and Plan:

I plan on attending a Ph.D. program in either Neuroscience or Molecular Genetics

### **ENDURE Trainee Summer Research Experience:**

ENDURE Summer Research Experience Institution: University of Colorado Denver Anschutz Medical Campus

Mentors/Advisors at ENDURE Summer Research Experience Institution: Matthew Taliaferro, PhD

# ENDURE Research Project Title: Understanding the Role of RNA Binding Proteins in Neuronal Cell Morphology

Neuron morphology is integral to the appropriate wiring of the nervous system. Defects in neuron morphology are associated with several neurological disorders. We are interested in the role that RNA binding proteins (RBPs) play in the development and maintenance of neuron morphology. RBPs have several roles in regulating RNA that when disrupted can result in improper cellular development and function. We have previously focused on the role that two Drosophila RBPs, Shep and Caper, play in neuronal development and shown that Shep and Caper are critical for proper neuron morphology and behavior. We hypothesize that mouse orthologs of Shep and Caper (RBM39, RBMS1, RBMS2, and RBMS3) will play similar roles in mouse neuronal cells. To test this, we aim to use CRISPR/Cas9 to create knockouts of the orthologs in mouse neuronal Neuro2A and CAD cells. We will then quantify differences in neuronal morphology between knockout cells and wildtype cells. We have designed guide RNAs that effectively mediate cutting of genomic DNA at exons near the N-terminus of the RBPs: RBM39, RBMS1, RBMS2, and RBMS3. We will develop stable RBP knockouts by using a donor construct to insert a stop codon, polyA site, and G418 resistance cassette at the target site.

## ENDURE TRAINEE INFORMATION AND RESEARCH ABSTRACTS

## BRIDGE TO THE PH.D. IN NEUROSCIENCE

MICHIGAN STATE UNIVERSITY

Principal Investigator: *Dr. William Atchison* Partner Institutions: St. Mary's University, Northern New Mexico College, University of Puerto Rico-Arecibo, and University of Puerto Rico-Cayey

#### PROGRAM DESCRIPTION:

The goal of "Bridge to the Ph.D. in Neuroscience" is to increase the number of underrepresented minority (URM) Ph.D.s trained in neurosciences: specifically, to facilitate their entry into high quality and highly competitive mainland Ph.D. or dual degree) programs with a neuroscience emphasis and enhance their likeliness of their success in the program. Central to this is the need to 1) identify talented students with potential for Ph.D. studies in neuroscience; 2) introduce them to career opportunities in neuroscience; 3) provide research training and individual mentoring; 4) increase their competitiveness for graduate study; 5) and provide additional professional development activities. It entails established partnerships between MSU and 4 minority serving institutions (MSIs): two campuses in Puerto Rico in the University of Puerto Rico (UPR) system (UPR-Cayey and UPR-Arecibo), as well as two MSIs in the Southwest (Northern New Mexico College and St. Mary's University).

To introduce students to neuroscience, a day-long workshop entitled, "What is Neuroscience?" will be held annually on each of the partnering campuses. To sustain student interest in neuroscience, a twosemester videoconference journal club will be held at MSU and broadcast live to the 4 MSIs. Six URM students annually from the four MSIs will spend the fall semester between their 3rd and 5th years at MSU taking 9 credits of classwork and continuing on an original, hypothesis-based research project. Included will be a seminar-type course stressing translational and interdisciplinary approaches to understanding the etiology of human disease. This course will entail significant practice in writing, as well as an integral journal club. Improvement of communication skills will involve both informal and more formalized settings (research presentations, participation in class, journal club participation and paper writing).

This program will increase the number of URM students entering Ph.D. programs in neuro-/behavioral Science, by 1) increasing the student's awareness for research career opportunities in neuroscience, 2) improving their English language skills, 3) providing high quality mentored research experience during the undergraduate studies to 'springboard" the student into the Ph.D. program, and 4) providing further didactic training in neuroscience principles, scientific writing and career enrichment activities. Through these combined activities, the student will become more confident in the application process, present a more competitive application and make valuable contacts (network) with researchers at MSU and elsewhere.

Additional Program Team Members:

- Melissa Jaiman-Cruz Program Coordinator, Michigan State University
- Dr. Brian Mavis Co-Investigator, Michigan State University
- Dr. Robert Ross University of Puerto Rico Cayey
- Dr. Hirohito Torres University of Puerto Rico Arecibo
- Dr. Ulises M. Ricoy Northern New Mexico College
- Dr. Timothy D. Raabe St. Mary's University

## SARANGELICA ALAMO ORTIZ

Home Institution and State: University of Puerto Rico at Humacao, PR Email: alamoort@msu.edu Undergraduate Academic Level: Senior Undergraduate Major and Expected Graduation Date: General Biology, May 2020 Mentors/Advisors at Home Institution:

### **ENDURE Trainee Scientific Interest:**

For years I have been interested about the nervous system. I have had the opportunity to work in different areas related to neuroscience. First, I began with the central nervous system, investigating how it is disrupted by Methylmercury. Also, I worked on the enteric nervous system and its regulation of glucose. Those experiences made me be interested on neurophysiology and neurotoxicology.

## ENDURE Trainee Career Goals and Plan:

As an undergraduate I had different experiences investigating the nervous system. For the future I am planning to enter graduate school in order to study neuroscience. Once there, I would like to investigate in something related to neurotoxicology, since I am interested in how the disruption of chemicals can cause changes in a molecular and macromolecular level.

## **ENDURE Trainee Summer Research Experience:**

ENDURE Summer Research Experience Institution: Michigan State University

Mentors/Advisors at ENDURE Summer Research Experience Institution: Yihang Li, PhD, and Adam J. Moeser, PhD

# ENDURE Research Project Title: Enteric Neural Regulation of Glucose Transport in Pigs Exposed to Early Life Adversity

Early life adversity (ELA) is a major risk factor for later life susceptibility to many gastrointestinal (GI) disorders and metabolic diseases such as obesity and Type 2 diabetes. The mechanistic link between ELA and later life disease risk is poorly understood. Our previous in pigs showed that ELA induces long-term alterations in intestinal epithelial glucose transport functions, characterized by a decrease in sodium glucose linked transporter 1 (SGLT1) function and upregulation of the facilitated glucose transporters GLUT2. Further, we showed that the reduced SGLT1 function was in part mediated by the enteric nervous system via cholinergic- and adrenergic -dependent pathways. The objective of the current study is to investigate the role of the ENS in modulating ELA-induced changes in GLUT2 expression and function in a porcine early weaning model of ELA. Ileal mucosa was harvested from 11-week-old early weaned (EWS) and late weaned (LW; controls) female pigs to investigate the impact of ELA and ENS activity on GLUT2-mediated glucose absorption in Ussing chambers and expression via Western blotting. In addition, measurements of fasted-state blood glucose levels were measured in EWS and LW pigs.
### ANDREA ALDAZ

Home Institution and State: **St. Mary's University, TX** Email: **aaldaz1@mail.stmarytx.edu** Undergraduate Academic Level: **Sophomore** Undergraduate Major and Expected Graduation Date: **Biochemistry, May 2021** Mentors/Advisors at Home Institution: **William D. Atchison, PhD** 

### **ENDURE Trainee Scientific Interest:**

I am interested in biomedical based research. The research done in this poster was specialized with neuroscience research focusing on the effects of methylmercury on alpha motor neurons. When hearing of a disease not previously known of, there is an eagerness to find out the specifics on the ways in which it alters the body. This among other interests leads to the belief that the fascination and aspiration to understand on a profound biological level is an instinctive path to take.

### ENDURE Trainee Career Goals and Plan:

I wish to study biomedical sciences at the University of Texas where it not only will strengthen my knowledge, but provide me a career path, allowing me to apply this understanding of biomedicine to the natural world, by determining ways to treat life-threatening diseases, some of which include, cancer, HIV, or ALS. I recognize that there will be many obstacles along the way, however I feel I have the diligence and confidence to encourage myself to challenge and overcome and develop into a valuable component of the profession I truly strive for.

### **ENDURE Trainee Summer Research Experience:**

ENDURE Summer Research Experience Institution: Michigan State University

Mentors/Advisors at ENDURE Summer Research Experience Institution: Monica Rios-Cabanillas and William D. Atchison, PhD

ENDURE Research Project Title: Role of internal calcium pools during acute methylmercury-induced cell death in the C57BL6J mouse

Methylmercury (MeHg) targets  $\alpha$ -motor neurons ( $\alpha$ MNs) located in the lumbar region of the spinal cord.  $\alpha$ MNs are important for skeletal movement; their degeneration is a key feature of amyotrophic lateral sclerosis. MeHg-induced cell death results from uncontrolled increase in internal calcium concentration ([Ca<sup>2+</sup>]i). The initial effect is release of Ca<sup>2+</sup> from internal organelles (mitochondria and smooth endoplasmic reticulum (SER)) followed by extracellular Ca<sup>2+</sup> entry. Our purpose was to elucidate the immediate and delayed contribution that mitochondria and SER provide during MeHg-induced cell death. This was being performed using lumbar spinal cord slices isolated from C57BL6J mice, and calcein-AM, fluorophore that label viable cells green. Viability was determined following a 15min [20µM] MeHg exposure in the absence and presence of chemicals that modulate internal Ca<sup>2+</sup> pools: Carbonyl cyanide m-chlorophenyl hydrazone (CCCP) and thapsigargin. We hypothesized that these two compounds would increase [Ca<sup>2+</sup>]i increasing further incidence of MeHg-induced cell death. MeHg alone significantly decreases viability from baseline at 3hrs post-MeHg by 0.65 relative change. Internal Ca<sup>2+</sup> stores contribute to MeHg-induced cell death since the MeHg+CCCP+thapsigargin shows a significant viability loss by 0.52 relative change from MeHg control group. This project sheds light on the role of Ca<sup>2+</sup>i organelles to MeHg-induced neuronal death.

## **GLORIAN BERRIOS-VAZQUEZ**

Home Institution and State: University of Puerto Rico at Humacao, PR Email: glorian.berrios@upr.edu Undergraduate Academic Level: Senior Undergraduate Major and Expected Graduation Date: General Biology, May 2019 Mentors/Advisors at Home Institution:

### **ENDURE Trainee Scientific Interest:**

My interests in research involve the neurotoxicology field. I am very interested in how toxins affect the nervous system and their role in neurodegenerative diseases such as ASL and Alzheimer's disease.

### ENDURE Trainee Career Goals and Plan:

My current career goal is obtaining a D.V.M./Ph.D., where I would be able to work directly with animals and still be able to do research in comparative medicine, where animal models can help biomedical research and the understanding of diverse diseases. I believe a Ph.D. in neuroscience will help me explore my potential as a scientist and at the same time contribute to veterinary and human medicine.

### **ENDURE Trainee Summer Research Experience:**

ENDURE Summer Research Experience Institution: Michigan State University

Mentors/Advisors at ENDURE Summer Research Experience Institution: John J. LaPres, PhD

# ENDURE Research Project Title: Crosstalk Between TSPO and the AHR Pathways Regulates Gene Expression and the Response to Oxidative Stress in Murine Microglial Cells

The 18-kDA Translocator protein (TSPO, also known as the peripheral benzodiazepine receptor) has been associated with many biological functions, including cholesterol transport and steroidogenesis, apoptosis, response to oxidative stress, and immunomodulation. TSPO has been shown to bind several cellular compounds, including cholesterol and heme metabolites. Several of these endogenous TSPO ligands are also linked to the aryl hydrocarbon receptor (AHR). The AHR is a ligand activated transcription factor that also plays a role in several biological processes, including immunomodulation. The AHR mediates most, if not all, of the toxicity associated with planar aromatic hydrocarbons, such as 2,3,7,8-tetrachlorodibenzo-rdioxin (TCDD). The aim of this study is to assess the crosstalk between the TSPO and the AHR at the level of gene expression and response to oxidative stress using BV2 murine microglial cell line as a model. Using quantitative reverse transcriptase polymerase chain reaction (ORTPCR), 16 genes that encode for enzymes that metabolize tryptophan were evaluated. In addition, MTT and protein assays were performed in the presence of tellurite to determine if TSPO and the AHR can modulate metal-induced oxidative stress. Our results demonstrate that an exogenous ligand for TSPO, PK11195, and TCDD alter the expression of specific genes within the tryptophan metabolic pathway, such as Ido1, Ido2, and Tdo1, and modulate tellurite-induced cytotoxicity. The overlap between TSPO and AHR activation suggest that these two signaling pathways overlap and are potential therapeutic targets for neuroinflammation. Currently, we are in process of creating AHR and TSPO null BV2 cell strains using CRISPR-Cas9 to directly test the signaling overlap.

### NICOLE CAMACHO-FONTANEZ

Home Institution and State: Universidad del Turabo, PR Email: ncamacho29@email.suagm.edu Undergraduate Academic Level: Junior Undergraduate Major and Expected Graduation Date: Biology, May 2021 Mentors/Advisors at Home Institution: Eileen Rodriguez-Tapia, PhD

### **ENDURE Trainee Scientific Interest:**

My main interest is the study of the pathophysiology of psychiatric disorders and their pharmacological treatments.

### **ENDURE Trainee Career Goals and Plan:**

To acquire an M.D./Ph.D. in Neuroscience and Psychiatry in order to conduct research that will lead to the development of new treatments for mental disorders.

### **ENDURE Trainee Summer Research Experience:**

ENDURE Summer Research Experience Institution: Michigan State University

Mentors/Advisors at ENDURE Summer Research Experience Institution: Duanghathai Wiwatratana, MS and Bill Atchison, PhD

# ENDURE Research Project Title: Neuroprotective effect of N-acetylcysteine on mouse motor-neuron like cells in methylmercury-induced toxicity

MeHg decreases glutathione synthesis, which triggers expression of antioxidants from the Nrf2 pathway. Since N-acetylcysteine (NAC) has antioxidant qualities and is a precursor for GSH synthesis, we tested its neuroprotective effects on motor neurons in methylmercury induced toxicity using the mouse motor neuron-like cell line (NSC34). Cells were treated for 2h with 1mM, 10µM, and 100µM NAC before exposure to 5µM MeHg. Cell viability was measured every 3h thereafter. The neuro-rescue effect of NAC was measured by treating cells with 1mM, 10µM, 5µM, 1µM and 0.5µM NAC after 3h of 5µM MeHg exposure. This study suggests 1mM NAC sufficiently protects the NSC34 cells against MeHg, and a higher NAC concentration is imperative for recovery after MeHg-induced neurodegeneration. Expression of Superoxide dismutase-1 (SOD1) and superoxide dismutase-2 (SOD2) were measured after 18h MeHg exposure. Their expression of excitatory amino acid transporter 3 (EAAT3) and subunit 2 (GluA2) of  $\alpha$ -amino-3-hydroxy-5-methyl-4-isoxazolepropionic acid receptor (AMPAR), were determined to characterize the dysregulation of glutamate transmission. The immunofluorescence results indicated EAAT3 and GluA2 subunit appeared to be diminished in MeHg exposure, while NSC34 cells treated with NAC maintain these protein expressions.

### NATASHA MENDEZ-ALBELO

Home Institution and State: Universidad Metropolitana, PR Email: natashamendez0@gmail.com Undergraduate Academic Level: Senior Undergraduate Major and Expected Graduation Date: Cell and Molecular Biology, 2020 Mentors/Advisors at Home Institution: Diana Gomez-Garzon, PhD

### **ENDURE Trainee Scientific Interest:**

Throughout my high school education, I had the opportunity to conduct research related to botany. In addition, I am currently part of the research team in the Molecular Genomics laboratory of Dr. Diana Gomez Garson, titled "Pharmacogenomics of gene expressions activated by antiviral drugs an in vitro model", investigating how two drugs, RBV and AZT, affect the morphology of cells and the formation of proteins. This summer I had the opportunity to participate in the BPNP program at MSU and be part of Veenema's lab, where I learned more about the components and complexity of the nervous system. For these reasons, this summer I can say that I decided what I wanted to be doing for the rest of my life: neuroscience, not only molecular but also behavioral.

### ENDURE Trainee Career Goals and Plan:

As a child, I was always interested in helping people, learning new things, and understanding how and why things work, especially in science related topics. As I explored the many career paths in the biology field, I realized that I was highly interested in solving problems and seeking answers to challenging questions through research. For this reason, I decided to study cell and molecular biology as a bachelor's degree, with the purpose of eventually pursuing a Ph.D. in Neuroscience.

### **ENDURE Trainee Summer Research Experience:**

ENDURE Summer Research Experience Institution: Michigan State University

Mentors/Advisors at ENDURE Summer Research Experience Institution: Alexa Veenema, PhD

# ENDURE Research Project Title: The Relationship Between the Motivational Drives of Food-Seeking and Social Interaction in Adolescent Female and Male Rats.

The innate motivation to seek food is crucial for all organisms to survive. However, survival also relies on the development and display of appropriate social interactions. Social interaction can be particularly crucial during adolescence because it is critical for the development of certain cognitive, motor coordination, and social skills. However, the ways that the internal motivational drives of food-seeking and social interaction compete with each other using a three-chamber preference test. During this test, adolescent experimental female and male rats were given the choice to investigate food (standard laboratory chow) or a rat (matched for sex and age) located in corrals on opposite ends of the apparatus. Preference was determined by calculating the relative amount of time the experimental rats spent interacting with each stimulus (i.e., food and rat). We were interested in how preference would change when differing the strength of these motivational drives (seeking food or seeking social contact). To investigate this, rats were tested under two feeding conditions (food-deprived vs. sated) and two social conditions (isolated vs. pair housed).

### YAMILKA RIOS GUADALUPE

Home Institution and State: University of Puerto Rico Humacao, PR Email: yamilka.rios@upr.edu Undergraduate Academic Level: Senior Undergraduate Major and Expected Graduation Date: Biology, May 2019 Mentors/Advisors at Home Institution:

### **ENDURE Trainee Scientific Interest:**

The areas I have most interest in are: cognitive and behavioral neuroscience, neurobiological link with behavioral mental diseases, epidemiology and toxicology.

### ENDURE Trainee Career Goals and Plan:

My professional short-term goals are: getting a B.S. in Biology and developing research and professional skills that will help me get into graduate school. My long-term goals include getting a Ph.D. in biomedical sciences, and later working as a professor and researcher in a university, and coaching a local swimming team.

### **ENDURE Trainee Summer Research Experience:**

ENDURE Summer Research Experience Institution: Michigan State University

Mentors/Advisors at ENDURE Summer Research Experience Institution: Joseph Lonstein, PhD, Greg Swain, PhD, and William Atchison, PhD

# ENDURE Research Project Title: Changes in the serotonergic fiber density in the somatosensory cortex across reproductive states in female rats

Motherhood involves many changes in the brain that are necessary for successful caregiving. The somatosensory cortex of lactating female rats undergoes neuroplastic changes in response to stimulation of the dams ventrum by pups. The neurotransmitter, serotonin, is known to be generally involved in neuroplasticity but it is unknown if serotonin in the somatosensory cortex changes across female reproduction and could contribute to its plasticity in mothers. To determine whether serotonin might have a role in somatosensory plasticity we will be conducting immunohistochemistry for serotonin and analyzing serotonin immunoreactive density in the somatosensory cortex across reproductive state in female rats. Specifically, serotonergic fiber density will be analyzed across 5 reproductive states in female rats: diestrus virgins, pregnancy day 10, within three hours of parturition, postpartum day 7 and postpartum day 18. We predict that serotonergic fiber density in the somatosensory cortex will vary across females in different reproductive states, with lactating rats having a higher density of serotonin fibers than non-lactating rats. This higher serotonin fiber density would suggest a role for this neurotransmitter in the neuroplastic changes found in the somatosensory cortex during lactation, with implications for changes in how mothers sense tactile inputs from their young.

## NICOLE RIVERA-CAQUIAS

Home Institution and State: **Pontifical Catholic University of Puerto Rico, PR** Email: **nriveracaquias1@pucpr.edu** Undergraduate Academic Level: **Senior** Undergraduate Major and Expected Graduation Date: **Psychology, 2019** Mentors/Advisors at Home Institution:

### **ENDURE Trainee Scientific Interest:**

My research interest is toward the neurodevelopmental disorder; Autism Spectrum Disorder (ASD). This disorder is characterized by deficits in social communication and a pattern of restrictive and repetitive behaviors. Research has shown that parent training (PT) is an evidence-based intervention that has helped children improve their social communication and develop new skills. Unfortunately, families of children with ASD report an unmet provision of this service. The purpose of my project was to find out if behavioral analysts are being trained on providing PT and which factors benefit or discourage them from providing the service.

### ENDURE Trainee Career Goals and Plan:

My short-term career goal is to graduate university with a bachelor's in science and a major in Psychology. I then want to be accepted in a Clinical Psychology Ph.D. program and after having my doctoral degree, I want to continue my post-doctorate education in Neuropsychology. During that time, I plan on conducting research on neurodevelopmental disorders such as Autism and would like to in the future, in addition to researching, work in a hospital setting as well.

### **ENDURE Trainee Summer Research Experience:**

ENDURE Summer Research Experience Institution: Michigan State University

Mentors/Advisors at ENDURE Summer Research Experience Institution: Brooke Ingersoll, PhD

# ENDURE Research Project Title: Depicting Behavioral Analysts' Parent Training Practices for Children with Autism Spectrum Disorder

Parent training (PT) is an evidence-based intervention in which providers collaboratively train parents of children with childhood disorders about strategies to help their child develop new skills and change their behavior. Not much is known about behavior analysts' education and PT practices with families of children with Autism Spectrum Disorder (ASD) across the United States. For this reason, this project aimed to study: 1) To what extent do Board Certified Behavior Analyst (BCBA) programs teach PT concepts? and 2) Which factors predict behavior analysts' use of PT strategies with children with ASD? To answer our first question, Behavior Analysis graduate programs from universities (N=48) across the United States were evaluated in terms of their courses and content related to PT. To answer our second question, 1,415 BCBAs in the United States completed a survey to describe current PT practices, barriers and facilitators to providing PT and professional training experiences related to PT. Results lead us to say that pre-service training for behavior analysts does not adequately cover PT, and for this reason more coursework on PT would significantly increase behavior analysts' strategy use in their provision of PT to families of children with ASD.

## NICOLE RIVERA LOPEZ

Home Institution and State: Syracuse University, NY Email: nriver02@syr.edu Undergraduate Academic Level: Junior Undergraduate Major and Expected Graduation Date: Biotechnology, May 2020 Mentors/Advisors at Home Institution:

### **ENDURE Trainee Scientific Interest:**

During Michigan State University's Bridge to Ph.D. in Neuroscience Program, I was placed in the Pharmacology and Toxicology department in a lab that fixated on methyl mercury neurotoxicity. My project mainly focused on internal calcium store levels in neurons and how this related to cell membrane depolarization. Moreover, through papers published by my principal investigator I learned that my research could help the understanding of amyotrophic lateral sclerosis. For this reason, I would like to continue research mainly in neurodegenerative diseases.

### ENDURE Trainee Career Goals and Plan:

My plans after my undergraduate studies are to get a master's degree in Biotechnology. Additionally, I would like to focus on the bioscience track in my future research studies. Initially my intentions were to go straight into medical school after earning a bachelor's degree, however, this past summer I got to experience lab research for the first time in Michigan State University's Bridge to Ph.D. in Neuroscience Program. This experience helped me understand the importance and impact research has in our daily lives. I am drawn by the opportunity the institution offered me to do research. For this reason, I would like to keep pursuing research studies as a part of my future career.

### **ENDURE Trainee Summer Research Experience:**

ENDURE Summer Research Experience Institution: Michigan State University

Mentors/Advisors at ENDURE Summer Research Experience Institution: Mónica Ríos-Cabanillas and William Atchison, PhD

# ENDURE Research Project Title: Role of internal calcium pools during acute methylmercury-mediated increase in internal calcium concentration in C57BL6J mouse spinal cord slices

Methylmercury (MeHg) is an organic environmental contaminant. It affects both sensory and motor neurons. In isolated motor neurons in culture, a key contributor to MeHg neurotoxicity is dysregulation of intracellular calcium (Ca2+)i homeostasis and subsequent hyperexcitability. The MeHg-mediated increase in Ca<sup>2+</sup>i concentration ([Ca<sup>2+</sup>]i) occurs in two kinetically distinct phases. Phase 1 is due to Ca<sup>2+</sup> release from the cytosolic Ca2+ pools: mitochondria and smooth endoplasmic reticulum (SER). Phase 2 corresponds to Ca<sup>2+</sup> entering the cell across the plasma membrane by several mechanisms. The relative contributions that mitochondria and SER have to MeHg-induced increases in motor neuron [Ca<sup>2+</sup>]i have not yet been reported. The aim of this project is to elucidate to what extent internal Ca<sup>2+</sup> pools contribute to elevations of [Ca<sup>2+</sup>]i following an acute 20µM MeHg exposure. Lumbar sections spinal cord of adult C57BL6J mice are exposed to MeHg during 15 min through a real-time perfusion system. Ca<sup>2+</sup> changes in motor neurons are recorded using Fluo4-AM, a fluorescent Ca2+ indicator at 15min of MeHg exposure in the absence and presence of carbonyl cyanide m-chlorophenyl hydrazone (CCCP) and thapsigargin, to deplete the mitochondria and to block Ca<sup>2+</sup> uptake through the endoplasmic reticulum Ca<sup>2+</sup>-ATPase (SERCA), respectively. In the presence of these chemicals, MeHg-mediated [Ca<sup>2+</sup>]i is hypothesized to be higher compared to MeHg treatment alone, especially during Phase 1, which is dependent on Ca<sup>2+</sup>i stores. This research may help understand mechanisms involved in the motor neuron Ca<sup>2+</sup> dysregulation during MeHg toxicity.

### **CRISTINA RIVERA QUILES**

Home Institution and State: University of Puerto Rico Cayey, PR Email: cristina.rivera26@upr.edu Undergraduate Academic Level: Senior Undergraduate Major and Expected Graduation Date: Biology, May 2020 Mentors/Advisors at Home Institution:

### **ENDURE Trainee Scientific Interest:**

My research interests involve cellular and behavioral understanding of the nervous system. Also, I'm interested in genetics and the genetic basis of neuronal disorders.

### ENDURE Trainee Career Goals and Plan:

My career goal is to obtain a Ph.D. in neuroscience.

### **ENDURE Trainee Summer Research Experience:**

ENDURE Summer Research Experience Institution:

Mentors/Advisors at ENDURE Summer Research Experience Institution:

#### ENDURE Research Project Title: Generation and Characterization of mESC-derived Oculomotor Neuron Models of Congenital Cranial Dysinnervation Disorders

Congenital cranial dysinnervation disorders (CCDDs) are rare disorders characterized by aberrant or absent innervation of the cranial musculature. A subclass of CCDDs called congenital fibrosis of the extraocular muscles (CFEOM) is caused by heterozygous variants in genes including KIF21A and TUBB3. Differentiation of mouse embryonic stem cells (mESCs) using transcription factors produces oculomotor-like neurons (Mazzoni et al., 2013), which can enable screening of novel candidate causal CCDD variants. However, the validity of these cells for modeling CCDDs hasn't been established. Using CRISPR/Cas9-mediated genome editing or base editing (BE), we planned to introduce known pathogenic CCDD variants in Kif21a and Tubb3 into mESCs and measure subsequent phenotypic changes, such as neuronal survival, axon growth characteristics, and neuronal, axonal, and growth cone morphology. We designed guide RNAs for knockout of Tubb3 and Kif21a and knockin of CFEOM-causing missense mutations. We verified efficient gene editing using PCR amplification and restriction digests. We characterized differentiated wild-type neurons using neuronal markers. We expect that BE will lead to more efficient knock-in of variants than traditional CRISPR/Cas9. We expect mutated cells to exhibit impaired axon outgrowth and/or morphology. Collectively, this data will allow us to validate mESCs as models for testing other candidate causal CCDD variants.

### SIMON SANCHEZ

Home Institution and State: **St. Mary's University, TX** Email: **swolfsanchez@outlook.com** Undergraduate Academic Level: **Senior** Undergraduate Major and Expected Graduation Date: **Biophysics, May 2020** Mentors/Advisors at Home Institution: **Richard Cardenas, PhD** 

### **ENDURE Trainee Scientific Interest:**

I'm interested in neurobiology and molecular neuroscience as well as neuroengineering as it relates to understanding intelligence and brain machine interfaces.

### ENDURE Trainee Career Goals and Plan:

My goal is to continue the investment of my education and development as scientist, pursue a position in a graduate school program, and graduate with a Ph.D. in neuroscience.

### **ENDURE Trainee Summer Research Experience:**

ENDURE Summer Research Experience Institution:

Mentors/Advisors at ENDURE Summer Research Experience Institution:

# ENDURE Research Project Title: Overexpression of Fur1 in Glia cells and its affects in aggression in Drosophila

Aggression in seen in all species of animals and plays an essential role in survival. The ability of an animal to acquire resources requires combative or dominant behavior to establish an ownership of these resources. The fruit fly, Drosophila melanogaster, is no different. In Drosophila, both males and females elicit aggressive behavior against the same sex for resources and survival. Drosophila is a great model organism to study aggression because 1) the aggressive behavior can be quantified; 2) genetic manipulation is easily achieved; and 3) flies are easy to grow and maintain. The role of glia in behavior such as courtship, sleep, learning, and memory has been studied; however, the role of glia in aggression remains to be examined. In this study, we focus on glial cells and examine their role in aggression. We used the Gal4/UAS system and generated a line of flies with three trans genes, Repo-Gal4, UAS-TrpA1, and UAS-Fur1 to examine the role of glial cells in aggression. Developing a better understanding of aggression at the neurobiological level will aid in development of treatments for people faced with problems related to aggressive behavior.

## **KRYSTAL SANTIAGO**

Home Institution and State: University of Puerto Rico at Cayey, PR Email: krystal.santiago14@upr.edu Undergraduate Academic Level: Sophomore Undergraduate Major and Expected Graduation Date: Biology, 2021 Mentors/Advisors at Home Institution:

### **ENDURE Trainee Scientific Interest:**

As a scientist in training, the field of science is still infinite for me to explore. The beauty of science is how far knowledge can go through research. My research interest lies on the outcomes of dysfunction of the nervous system, but I am not specifically focused in using one discipline to intervene and study. Modern science is moving towards a more interdisciplinary community, where frontiers are non-existent and new fields can emerge. Because of this, my scientific interest is to enrich my knowledge, experience and work with all the unfathomable disciplines of science so that eventually, I can join this community.

### ENDURE Trainee Career Goals and Plan:

As a sophomore, I am still decisively discovering and exploring for an epitome of how my career can be, or maybe developing it on my own. But certainly, I had few experiences that introduced me to an interdisciplinary scientific community that I would like to be a part of. There is an intuition leading me to enter a M.D./Ph.D. program and make the Ph.D. in Translational Science. Before pursuing graduate school, I would like to continue doing promising research and present them in conferences so that I can be introduced to new graduate programs that correlate with my professional and personal aspirations.

### **ENDURE Trainee Summer Research Experience:**

ENDURE Summer Research Experience Institution: Michigan State University

Mentors/Advisors at ENDURE Summer Research Experience Institution: Gretchen Rivera and William Atchison, PhD

# ENDURE Research Project Title: Effects of Methylmercury on Excitatory Amino Acid Transporters Expression in Cortical Astrocytes and NSC-34 Cells

Excitatory amino acid transporters (EAATs) have the important role of removing extracellular glutamate from the synaptic cleft. Methylmercury (MeHg) is an environmentally acquired toxicant identified as excitotoxic which induces excessive release of glutamate. Scientific literature suggests that MeHg induces EAAT impairment by Reactive Oxygen Species generation. EAAT1 and EAAT2 are primarily expressed in astrocytes and EAAT3 in neurons. We hypothesized that MeHg exposure could exacerbate expression of EAATs in both astrocytes and motor neuron-like cells. To assess the effects of MeHg in the transporters, cortical astrocytes, extracted from mice, and motor neuron-like (NSC-34) cells were cultured and exposed to 1, 2 and 5µM MeHg for 3 hours. The capacity of EAAT expression after MeHg exposure was examined using immunocytochemistry and the images were analyzed by the mean fluorescence intensity to quantify the expression. We observed that MeHg induced EAAT3 overexpression by increasing the concentration of exposure. In addition, cortical astrocyte EAAT1 and EAAT2 expression were not affected by MeHg after 3 hours of exposure. For future work, we would like to evaluate gene expression and function of EAATs after MeHg exposure. Modulating EAATs function may be a therapeutic target to attenuate excitotoxicity-induced pathogenesis in diseases like Amyotrophic Lateral Sclerosis.

### JAZMIN SOTOMAYOR ORTIZ

Home Institution and State: Michigan State University, MI Email: jazmin.sotomayor@upr.edu Undergraduate Academic Level: Senior Undergraduate Major and Expected Graduation Date: Microbiology, 2021 Mentors/Advisors at Home Institution: Alberto Perez Medina and James Galligan, PhD

### **ENDURE Trainee Scientific Interest:**

I am very interested in Human Biology, and I am also very intrigued by how nervous system works. The more I know and understand about its function, the more fascinated I am by it and the more I want to learn about it. My research interests include neurodegenerative diseases. Specifically, since a few years ago, I have been interested in Alzheimer's Disease. I have always been amazed at the very drastic way in which this disease affects a human being, and at how little is understood about it. I am also interested in cytology and molecular biology.

### **ENDURE Trainee Career Goals and Plan:**

My long-term career goal is to achieve an M.D./Ph.D., since being a medical doctor has been my career goal forever, literally. Over the course of the years in school and in college, my love and interest for science, for helping people, and for research has only been confirmed. My interest in neuroscience came about when I was in ninth grade, through a Health class project, and it was then I decided I wanted to be a neurologist.

### **ENDURE Trainee Summer Research Experience:**

ENDURE Summer Research Experience Institution: Michigan State University

Mentors/Advisors at ENDURE Summer Research Experience Institution: Alberto Pérez Medina and James Galligan, PhD

ENDURE Research Project Title: Validation of the specificity of an antibody against the important myenteric neuronal marker, the vesicular nucleotide transporter protein

The enteric nervous system (ENS), known as "the little brain of the gut," is the intrinsic network of neurons and nerve fibers embedded in the gut wall. The ENS is composed of the myenteric and submucosal plexuses; the myenteric plexus controls gut motility, and the submucosal plexus controls secretion. The myenteric plexus contains nerves that release acetylcholine to cause muscle contraction and nerves that release ATP to cause muscle relaxation. ATP is the energy molecule that is found in every cell. However, in nerves, ATP is packaged into synaptic vesicles by the vesicular nucleotide transporter (VNUT). We tested the hypothesis that an antibody against VNUT would identify the inhibitory ATP (purinergic) nerves in the myenteric plexus, using immunohistochemistry methods, fluorescence microscopy, and the VNUT antibody to localize purinergic nerves in the mouse gastrointestinal (GI) tract. We also verified the specificity of the VNUT antibody using western blot to confirm siRNA knockdown of endogenously expressed VNUT in PC12 cells. Western blot results suggest that the VNUT antibody does label its target antigen and immunohistochemistry results suggest that there is a subpopulation of purinergic nerves in the muscle layers of the mouse GI tract. The VNUT antibody will be an important new tool for studying the ENS and will help us better understand the function of the ENS both in health and disease.

## ENDURE TRAINEE INFORMATION AND RESEARCH ABSTRACTS

## **BP-ENDURE ST. LOUIS: A NEUROSCIENCE PIPELINE**

WASHINGTON UNIVERSITY IN ST. LOUIS Principal Investigator: *Dr. Erik Herzog* Partner Institutions: University of Missouri-St. Louis and Harris-Stowe State University

#### PROGRAM DESCRIPTION:

The objective of the program is to provide rigorous and critical training in neuroscience to a diverse cohort of students from three partner institutions (Washington University, the University of Missouri-St. Louis and Harris-Stowe State University). By providing support for 10 funded positions for summer research, this proposal will establish a pipeline to graduate school. The Pipeline emphasizes sustained training in oral and written science communication, discovery science and outreach experience. Specifically, this proposal will support 10 early-stage trainees annually for up to three years each. Our Pipeline has long-standing commitments to cutting-edge research, to interdisciplinary education, and to providing modern career development.

We seek to be a program that responds to changes in the research environment by helping our students to pursue important and innovative problems and concepts, to adopt new techniques and to communicate effectively with their peers and the general public. The proposal will allow for the addition of three interactive and immersive courses that will appeal to teens and create a community of young scientists who can begin as early as the summer after their freshman year. The curriculum and research environments will remain broad and deep, combining expertise in molecular, cellular and systems-level approaches to the study of neural function and dysfunction.

Major new initiatives aimed at accomplishing these goals include: 1) the establishment of a new network of research opportunities for undergraduates interested in the neurosciences, 2) the introduction of three interactive courses (The Teen Brain, Neuroscience Futures, and Skills for a Neuroscientist) to bolster neuroscience fundamentals and a sense of community among the students, 3) enhanced involvement of the undergraduates in the Society for Neuroscience Brain Bee as part of their training in science communication, and 4) refinement of a near peer-mentoring program that has graduate students working with undergraduates and undergraduates working with high school students. These initiatives will ensure our students remain at the forefront of developments in neuroscience research, teaching and outreach.

#### ADDITIONAL PROGRAM TEAM MEMBERS:

Rochelle Smith - Program Manager, Washington University

- Dr. Diana José-Edwards Program Coordinator, Washington University
- Dr. Sonya Bahar University of Missouri-St. Louis
- Dr. Robert Paul University of Missouri-St. Louis
- Dr. Jana Dorfman Marcette Harris-Stowe State University

### **KIA BARCLAY**

Home Institution and State: Wellesley College, MA Email: kbarclay@wellesley.edu Undergraduate Academic Level: Senior Undergraduate Major and Expected Graduation Date: Neuroscience, May 2019 Mentors/Advisors at Home Institution:

### **ENDURE Trainee Scientific Interest:**

My scientific interests lie in the area of addiction and drug abuse, as I seek to determine novel targets for addiction therapeutics. My first year in the ENDURE program has provided me with the opportunity to conduct independent research under the mentorship of prominent faculty and researchers at Washington University in St. Louis. It is through the ENDURE program that I have been able to further my understanding of how drugs effect molecular systems in the brain and have gained insight into potential targets for addiction therapeutics. Alongside the opportunity to conduct research, the ENDURE program has challenged me to be a more independent scientist and critical thinker.

### ENDURE Trainee Career Goals and Plan:

The ENDURE program has provided me with the opportunity to meet diverse individuals within the scientific community and has helped me narrow down my own career interest. With the support of the ENDURE program, I have received individual and group support which has helped build confidence in my own abilities. The mentorship provided by the ENDURE program has helped assure me of my own career path and has enabled me with the resources to obtain my own personal and career goals.

### **ENDURE Trainee Summer Research Experience:**

ENDURE Summer Research Experience Institution: Washington University in St. Louis

# Mentors/Advisors at ENDURE Summer Research Experience Institution: Ream Al-Hasani, PhD, and Manish Madasu, PhD

#### ENDURE Research Project Title: Characterizing Withdrawal in Mouse Models of Opioid Use

Opioids are drugs that act on opioid receptors in the nervous system, and whose mechanisms are known to facilitate the relief of pain. Despite their ability to serve as good therapies for pain, chronic use of opioids during post-operative care can lead to addiction. Currently, the U.S is facing an opioid epidemic, as over 11.5 million people in the U.S abuse opioids and over 115 people die daily from opioid overdose. Previous studies have found that withdrawal severity is implicated in drug reinstatement behavior. Many of these individuals seek illicit opioids to avoid painful withdrawal symptoms. Patient reports suggest that the FDAapproved overdose treatment Naloxone, a mu opioid receptor antagonist, precipitates more severe withdrawal than abstinence. Although previous research has examined withdrawal, the discrete neurocircuitry of withdrawal has yet to be fully elucidated. We are working on developing and improving existing in vivo models of opioid use to better understand withdrawal. Here we show two in vivo models of opioid use, morphine conditioned place preference and morphine two-bottle choice to measure both somatic and anxiety-like symptoms following naloxone-precipitated withdrawal. We show that both somatic signs and anxiety-like symptoms following naloxone-precipitated withdrawal can be assayed in these two in vivo models. The information provided in this study serves as supporting evidence for the role of the mu opioid receptor system in withdrawal, and provides new insight for a target of reducing withdrawal severity during opioid rehabilitation and decreasing drug reinstatement behavior.

## **SNEHA CHATURVEDI**

Home Institution and State: Washington University in St. Louis, MO Email: sneha.chaturvedi@wustl.edu Undergraduate Academic Level: Junior Undergraduate Major and Expected Graduation Date: Neuroscience, 2019 Mentors/Advisors at Home Institution: Jeff Jones, PhD, and Erik Herzog, PhD

### **ENDURE Trainee Scientific Interest:**

I am interested in circadian rhythms and how they might contribute to sex differences seen in biological systems.

### ENDURE Trainee Career Goals and Plan:

I plan to pursue a joint M.D./Ph.D. degree, which I can use to conduct translational research utilizing knowledge on patient care.

### **ENDURE Trainee Summer Research Experience:**

ENDURE Summer Research Experience Institution: Washington University in St. Louis

Mentors/Advisors at ENDURE Summer Research Experience Institution: Erik Herzog, PhD, and Jeff Jones, PhD

# ENDURE Research Project Title: Males differ from females in circadian glucocorticoid release, but not hypothalamic clock gene expression

Most biological processes are regulated by an internal circadian rhythm, critical for synchronizing bodily functions with the outside environment. Circadian outputs differ between females and males, with mechanisms for these differences unknown. Glucocorticoids, a class of stress hormones in vertebrates, provide a model for studying sexual dimorphism in circadian timing. Female rats show higher mean levels of corticosterone than males. It is not known where this sex difference arises in the HPA axis. To test the hypothesis that male-female differences in daily corticosterone secretion arise within the circadian system, we dissected the PVN and SCN from PER2::LUC male and proestrus-locked female mice. PER2::LUC provides a bioluminescent readout of the molecular circadian clock using expression of PER2, a core clock protein. We measured bioluminescence with a photomultiplier tube (PMT) for six days and compared the amplitude and period of PER2 expression. Both the SCN and PVN showed no significant difference in amplitude or period of PER2 rhythms between males and proestrus females. Our current results indicate the sex differences in glucocorticoid secretion originate further down the HPA axis. Investigating the reasons for sex differences in circadian output can lead to determining if diseases associated with HPA axis disruption exhibit sex differences.

### SARAH HUNTER

Home Institution and State: Emory University, GA Email: Sarah.hunter@emory.edu Undergraduate Academic Level: Junior Undergraduate Major and Expected Graduation Date: Neuroscience and Behavioral Biology, May 2020 Mentors/Advisors at Home Institution: Brian Dias, PhD

### **ENDURE Trainee Scientific Interest:**

I am interested in exploring neuronal connectivity and looking at how specific connections correspond to certain behavioral traits.

### ENDURE Trainee Career Goals and Plan:

I would like to pursue a Ph.D. and then work as a senior scientist in industry.

### **ENDURE Trainee Summer Research Experience:**

ENDURE Summer Research Experience Institution: Washington University in St. Louis

Mentors/Advisors at ENDURE Summer Research Experience Institution: Jordan McCall, PhD

# ENDURE Research Project Title: Activation of ventral tegmental area glutamatergic inputs to the locus coeruleus in negative affective behaviors

About one third depressed patients do not see an improvement in their depression with current monoamine pharmaceutical treatments. Multiple lines of research indicate disrupted glutamate signaling in the locus coeruleus (LC) in major depressive disorder. In particular, depressed individuals who have committed suicide have increased ionotropic and metabotropic glutamate receptors in the LC. Here, we identify a novel population of glutamate neurons projecting from the ventral tegmental area (VTA) to the LC. The VTA is highly involved in motivation and reward and is responsive to stress which can induce depression. Therefore, this projection is a particularly interesting circuit for investigating the glutamatergic regulation of depression. We hypothesize that glutamate transmission between the VTA and the LC is an important contributor to depression. To test this system directly, we used in vivo optogenetics to photostimulate excitatory VTA terminals in the LC while running a real-time place testing experiment to test for aversive behaviors. To determine whether activation of this projection can modulate anxiety-like behavior, we also used an elevated plus maze to assess the animals' level of anxiety with concurrent photostimulation. Remarkably, we found that animals exposed to a social isolation stress had increased clockwise rotations compared to group-housed animals, indicating that there is stress-induced plasticity of the VTA-LC projection. Further testing to understand this stimulation-induced rotation is underway, but these early studies suggest this newly-identified projection is aversive and modified by stress

### FABRIA JNO.BAPTISTE

Home Institution and State: University of Maryland Baltimore County, MD Email: fabriaj1@umbc.edu Undergraduate Academic Level: Senior Undergraduate Major and Expected Graduation Date: Chemical Engineering, May 2020 Mentors/Advisors at Home Institution: Jennie Leach, PhD

### **ENDURE Trainee Scientific Interest:**

My research interest include rehabilitation for those who have encountered traumatic brain and spinal cord injury.

### ENDURE Trainee Career Goals and Plan:

I intend to pursue a Ph.D. in Chemical Engineering.

### **ENDURE Trainee Summer Research Experience:**

ENDURE Summer Research Experience Institution: Northwestern University

Mentors/Advisors at ENDURE Summer Research Experience Institution: Andrea Domenighetti, PhD

ENDURE Research Project Title: Characterization of human muscle stem cells physiology on 3D printed biocompatible scaffolds

Cerebral Palsy (CP) is a disability spectrum that results from a primary insult to the brain in the embryonic or infant stage, leading to progressive movement impairment from early childhood to adulthood. While over 11,000 children are born with this musculoskeletal disability annually, there are currently no biological treatments that specifically target the progressive development of muscle impairment in CP. In an effort to improve the quality of life and overall care for children with CP, I work directly with MuSCs isolated from muscle biopsies obtained from hamstring muscles in CP and in typically developing children (TD). The main objective is to investigate new methods to improve postnatal muscle growth and regeneration in contractured muscle from children with CP. MuSCs are cultured in vitro on biocompatible 3D-printed 3% gelatin hydrogel scaffolds. The use of 3D scaffolds provides a better way to study cell behavior and can be manufactured to replicate an elastic modulus that reflects physiological muscle stiffness in vivo. Our preliminary data showed that human primary myoblasts seeded on 3D-printed hydrogel scaffolds can successfully fuse and differentiate into organized myotubes.

In this project I investigated the following aims: (1) To support ongoing research set to determine if scaffold stiffness affects MuSC-derived myoblast fusion and differentiation into myotubes. We hypothesize that myogenesis and myotube formation will be improved on scaffolds with a stiffness that recapitulates in vivo physiological conditions (10-20 kPa). We also hypothesize that physiological stiffnesses (10-20 kPa) will rescue myogenesis and myotube formation in CP preparations. (2) To define the cellular fate of the mononucleated myoblasts that do not fuse into multinucleated myotubes. We hypothesize that the non-fusing myoblasts will adopt an ECM-secreting myofibroblast phenotype. We also hypothesize that the number of myoblasts adopting an ECM-secreting phenotype is greater in CP than TD cell culture preparations.

### MICHAEL KANAN

Home Institution and State: Saint Louis University, MO Email: michael.kanan@slu.edu Undergraduate Academic Level: Senior Undergraduate Major and Expected Graduation Date: Neuroscience, Fall 2019 Mentors/Advisors at Home Institution: Tony Buchanan, PhD, and Michael Anch, PhD

### **ENDURE Trainee Scientific Interest:**

I am interested in studying the underlying biology of behavior, and the molecular mechanisms of neurodegeneration.

### ENDURE Trainee Career Goals and Plan:

I plan on entering an MSTP program in order to become a medical doctor and a Ph.D. in neuroscience. I will then use my training to further our understanding of the enigma that is the human brain.

### **ENDURE Trainee Summer Research Experience:**

ENDURE Summer Research Experience Institution: Washington University in St. Louis

Mentors/Advisors at ENDURE Summer Research Experience Institution: Erik Musiek, MD, PhD

ENDURE Research Project Title: The Role of Circadian Disruption in the Pathogenesis of Parkinson's Disease

Sleep disturbances are among the most common and debilitating non-motor symptoms of Parkinson's disease (PD) affecting as many as 90% of patients (Videnovic et al., 2014). Moreover, recent evidence suggests that brain aging is associated with a decrease in expression of proteins controlling normal circadian function, resulting in a disruption of normal sleep/wake cycles (Hastings et al., 2013). However, the relationship between disruptions of biological timing and the pathogenesis of PD are poorly understood. To examine this relationship, we first induced circadian dysfunction by globally knocking down the core circadian clock component BMAL1. WT and Bmal1 knockdown mice were then aged and unilaterally injected with synthetic alpha-synuclein ( $\alpha$ -syn) fibrils within the dorsal striatum, to mimic the pathological progression of PD. Compared to WT mice, we observed that BMAL1 knockdown mice exhibited significant loss of dopaminergic neurons within the substantia nigra pars compacta (SNpc), which is a characteristic feature of PD.  $\alpha$ -syn fibrils were also found to cluster throughout the ipsilateral striatum, cortex, amygdala, and ipsilateral SNpc. We observed similar  $\alpha$ -syn spreading in the brains of the WT and BMAL1 knockdown mice. This suggests a potential link between the circadian clock and neurodegeneration in PD independent of  $\alpha$ -synucleinopathy.

## **DENYE MICKENS**

Home Institution and State: Washington University in St. Louis, MO Email: mickensda@wustl.edu Undergraduate Academic Level: Sophomore Undergraduate Major and Expected Graduation Date: Biology, May 2021 Mentors/Advisors at Home Institution: Jeanne Nerbonne, PhD, Tracey Hermanstyne, PhD, Joey Ransdell, PhD, and Nicole Gore, JD

### **ENDURE Trainee Scientific Interest:**

I have a strong interest in cell excitability and the underlying mechanisms of ion channels. Currently, my research focuses on characterizing the functional roles of intracellular fibroblast growth factors (iFGFs) in modulating the densities and biophysical properties of potassium channels in the cardiac ventricle.

### ENDURE Trainee Career Goals and Plan:

I have strong aspirations of becoming a physician. After graduating from Washington University in St. Louis, I plan to enroll in an M.D./Ph.D. program. I feel that by having the training offered by both of these degrees, I will be more capable of bridging the gap between research and clinical practice and offering the best treatment possible to patients.

### **ENDURE Trainee Summer Research Experience:**

ENDURE Summer Research Experience Institution: Washington University in St. Louis

Mentors/Advisors at ENDURE Summer Research Experience Institution: Jeanne Nerbonne, PhD, and Tracey Hermanstyne, PhD

# ENDURE Research Project Title: Intracellular Fibroblast Growth Factors and the Modulation of Cardiac Ionic Currents

Proper cardiac function and the generation and repolarization of the cardiac action potential (AP) are dependent on the coordinated movement of ions such as sodium and potassium through specialized ion channels. These channels are thought to function as macromolecular protein complexes that comprise pore-forming alpha subunits and several accessory proteins, such as fibroblast growth factors (FGFs). FGFs are originally known for their regulatory roles in cell growth and differentiation; however, a unique subfamily of FGFs, known as the intracellular fibroblast growth factors 11-14 (iFGF11-14), has been shown to be structurally homologous, remain intracellular, and modulate the ion channels of the heart and the brain. It has been determined through qPCR analysis that FGF12 is the most robustly expressed iFGF gene across the human heart, while in mice, Fgf13 is expressed in both the atria and ventricles and Fgf12 is expressed only in the atria. These findings suggest that iFGFs may also differentially affect ionic currents, despite their homologous structures. Previous studies have shown that both iFGF12 and iFGF13 modulate sodium channels, but in a mouse ventricular Fgf13-/- model, the AP duration was prolonged. This finding suggested that iFGFs may modulate potassium channels as well. The experiments designed in this project. however, revealed that there were no significant (p > 0.05, Student t-test) differences in the densities of Ito,f in WT (22.4 ± 1.7 pA/pF) ventricular myocytes and Fgf13-/- (20.5 ± 2.2 pA/pF) or IK, slow in WT (16.5  $\pm$  0.8 pA/pF) and Fgf13-/- (15.6  $\pm$  1.7 pA/pF). Properties of activation and inactivation of these currents were also unaffected. These results indicate that Fgf13-/- does not play a functional role in modulating the biophysical properties of cardiac voltage-gated potassium channels. Further experiments are still needed to characterize the functional roles of iFGF13 in modulating cardiac firing properties.

### **BRUCE RAMPHAL**

Home Institution and State: Brown University, RI Email: bruce\_ramphal@brown.edu Undergraduate Academic Level: Senior Undergraduate Major and Expected Graduation Date: Neuroscience, May 2019 Mentors/Advisors at Home Institution: Monica Linden, PhD

### **ENDURE Trainee Scientific Interest:**

I am interested in how forms of structural inequality, such as economic poverty, affect brain development to influence mental health.

### ENDURE Trainee Career Goals and Plan:

I plan on doing research on perinatal brain development and social origins of mental illness while also being a practicing psychiatrist, particularly in communities that lack mental health resources.

### **ENDURE Trainee Summer Research Experience:**

ENDURE Summer Research Experience Institution: Washington University in St. Louis

Mentors/Advisors at ENDURE Summer Research Experience Institution: Chad Sylvester, MD, PhD

# ENDURE Research Project Title: Relations Among Socioeconomic Status, Brain Connectivity at Birth, and Psychiatric Symptoms at Age 2

Low socioeconomic status (SES) during childhood has been linked to the development of both externalizing and internalizing disorders. The brain mechanisms by which low SES at birth relates to behavioral outcomes are not well known. This study investigated whether neonatal resting state functional connectivity (rsfc) mediated the relationship between SES at birth and both externalizing symptoms and internalizing symptoms at age 2. In a sample of 112 newborns with high quality fMRI data, seed-based voxelwise linear regressions related whole-brain functional connectivity of five regions of interest to insurance type (public/private). Mediation analysis was employed to ascertain brain connections that mediate the relationships between insurance type and symptoms at age 2. Public health insurance at birth was associated with increased externalizing symptoms and decreased behavioral inhibition, one form of internalizing behavior, at age 2. Public health insurance was correlated with differences in left striatum and right ventrolateral prefrontal cortex connectivity (VLPFC). Left striatum connectivity mediated the relationship between insurance type and both externalizing symptoms and behavioral inhibition. These results show that differences in socioeconomic status are correlated with variation in neonatal striatum and VLPFC rsfc. Further, they suggest that neurodevelopmental trajectories linking poverty and psychopathology may begin as early as birth.

### **TAYLOR REID**

Home Institution and State: Washington Univerity in St.Louis, MO Email: tjreid@wustl.edu Undergraduate Academic Level: Sophomore Undergraduate Major and Expected Graduation Date: Computer Science/Psychology, May 2019 Mentors/Advisors at Home Institution: Aahana Bajracharya and Jonathan Peelle, PhD

### **ENDURE Trainee Scientific Interest:**

I am interested in neurodegenerative disorders.

### ENDURE Trainee Career Goals and Plan:

I want to get my Ph.D. in neuroscience.

### **ENDURE Trainee Summer Research Experience:**

ENDURE Summer Research Experience Institution: Washington University in St. Louis

Mentors/Advisors at ENDURE Summer Research Experience Institution: Aahana Bajracharya and Jonathan Peelle, PhD

# ENDURE Research Project Title: Meta-Analysis of Neuroimaging Literature to Understand Speech Processing

Understanding the brain networks that support speech comprehension is essential in helping those with hearing loss so that better treatments can be developed. The purpose of this study was to conduct a metaanalysis of published fMRI research to determine the brain regions involved in speech and to investigate if there are any age differences in speech processing. We used the online resource Neurosynth to conduct the meta-analysis; it indexes over 14,000 fMRI studies to extract brain coordinate results and then produces a brain activation map for a given neural state. We hypothesized that as the level of speech complexity increased, speech would be processed more in the left hemisphere and more frontal regions would be involved. Also, there are age-related physiological declines in the brain which may cause older adults to recruit more cognitive resources to understand speech. Thus, we predicted that older adults would have more frontal regions activated during speech comprehension. We wrote a Python script that pulled the relevant speech studies from the Neurosynth database to conduct a meta-analysis and then generated brain activation maps for each level of speech. The results supported the first hypothesis: higher levels of speech were processed in the left hemisphere and in frontal regions. The results comparing older adult and younger adults were inconclusive due to the limitations of how data are coded in Neurosynth. Despite the limitations in age comparison, the meta-analysis in Neurosynth found results that are consistent with other models.

## LUIS RUIZ

Home Institution and State: Washington University in St. Louis, MO Email: Iuisruiz@wustl.edu Undergraduate Academic Level: Junior Undergraduate Major and Expected Graduation Date: Biomedical Engineering, May 2020 Mentors/Advisors at Home Institution: Nikhil Chandra and Matthew MacEwan, PhD

### **ENDURE Trainee Scientific Interest:**

I am interested in the engineering of peripheral nervous system interfaces, and brain computer interfaces aiming to restore motor and/or sensory functions in patients who lost these functions following an injury.

### ENDURE Trainee Career Goals and Plan:

After graduating with a B.S. in biomedical engineering, I hope to enter a biomedical engineering Ph.D. program with an emphasis on neural engineering. Afterwards, I would like to complete post-doctoral program, and eventually open my own lab at a research institution. In my research, I hope to advance our capabilities of treating major spinal cord injuries.

### **ENDURE Trainee Summer Research Experience:**

ENDURE Summer Research Experience Institution: Washington University in St. Louis

Mentors/Advisors at ENDURE Summer Research Experience Institution: Matthew, MacEwan, MD/PhD Wilson, Ray, MD, and Nikhil Chandra

# ENDURE Research Project Title: Advancing Prosthetic Technology: Comparing the Sensory Capabilities of Macrosieve Electrodes & Extraneural Cuff Electrodes

Current prostheses cannot replicate the body's natural sensory feedback. Consequently, daily tasks become cognitive burdens. Prostheses with peripheral nervous system (PNS) interfacing electrodes could close this open feedback loop by transducing motor information downstream and sensory information upstream. The Ray/MacEwan lab is studying the macrosieve electrode (MSE) as a candidate for the prosthetic/PNS interface. My summer research aimed to access the MSE's and, as a comparison point, the extraneural cuff electrode's (ECE) sensory capabilities through the determination of their sensory detection thresholds. A rat sciatic model, and a Go-No Go task paradigm are being used to generate a psychometric curve plotting stimulus amplitude versus probability of perception. Following convention, detection thresholds are being defined as the current amplitude resulting in a 0.75 probability of perception. We hypothesize that the MSE will require lower current amplitudes to elicit a sensory response in comparison to ECEs. Low amplitudes prevent tissue damage, and lower power consumption–making the MSE preferable for clinical applications. The results from this study could strengthen the body of research advocating the adoption of MSEs in the development of a bidirectional prosthetists/PNS interface. Our study would help usher clinical applications to resolve many challenges amputees face every day.

### VANESSA SERRANO

Home Institution and State: San Diego State University, CA Email: vanessa.bserrano@yahoo.com Undergraduate Academic Level: Junior Undergraduate Major and Expected Graduation Date: Psychology, May 2020 Mentors/Advisors at Home Institution: Elizabeth Pasipanodya, PhD, Jessica Montoya, PhD, and Robert Heaton, PhD

### **ENDURE Trainee Scientific Interest:**

I am interested in the underlying neural mechanisms behind adolescent psychopathology and substance use as individuals develop into adults, in conjunction with psychosocial risk and protective factors. With the variety of cultures represented in the United States, I also believe that the intersection of culture and social maladaptation warrants attention. As our population continues to diversify, it is critical to study factors that could contribute to better health and quality of life among at-risk populations across the lifespan.

### ENDURE Trainee Career Goals and Plan:

My ultimate goal is to obtain a Ph.D. in clinical neuropsychology. Doing so will equip me with the skills, training, and flexibility necessary to teach and do research in a university setting. I also hope to use my acquired experiences and future training to contribute to the development of other minority students coming from disadvantaged backgrounds, who may face challenges when pursuing careers in science.

### ENDURE Trainee Summer Research Experience:

ENDURE Summer Research Experience Institution: Washington University in St. Louis

Mentors/Advisors at ENDURE Summer Research Experience Institution: Denise Head, PhD

#### ENDURE Research Project Title: Moderators of Age Effects on Allocentric Processing

Background: Allocentric processing (AP) involves encoding the relationship between landmarks in an environment, and declines with age. Working memory (WM) and processing speed (PS) may facilitate the efficient selection, categorization and integration of environmental stimuli. This study examined whether WM and PS moderate the relationship between age and AP. Method: Twenty older adults (M = 68 years, SD = 11) and 15 younger adults (M = 23 years, SD = 5) completed a virtual reality based measure of AP as well as measures of WM and PS. Results: There was a significant main effect of age on WM, t(33) = 2.22, p = .03, and PS, t(33) = 4.1, p < .05, but not on AP. In addition, young adults with high PS scored significantly higher than young adults with low PS on AP. However, the results did not indicate significant interactions of age with WM or PS (p's > .47). Conclusions: The magnitude of age differences in allocentric processing did not vary by either working memory capacity or processing speed. Future research should investigate the impact of similar executive skills on AP among healthy older adults and those affected by pathology.

### DAVID TYUS

Home Institution and State: Washington University in St. Louis, MO Email: davidtyus@wustl.edu Undergraduate Academic Level: Senior Undergraduate Major and Expected Graduation Date: Biology, May 2019 Mentors/Advisors at Home Institution: Warren Davis, MA

### **ENDURE Trainee Scientific Interest:**

I am interested in how cells work to shape the nervous system and its emergent properties. I also enjoy learning about crosstalk of the central nervous system with other systems (e.g. neuroimmune interactions).

### ENDURE Trainee Career Goals and Plan:

I hope to go to graduate school and become a full-time researcher.

### **ENDURE Trainee Summer Research Experience:**

ENDURE Summer Research Experience Institution: Washington University in St. Louis

Mentors/Advisors at ENDURE Summer Research Experience Institution: Kevin Mastro, PhD, and Beth Stevens, PhD

# ENDURE Research Project Title: Behavioral and Anatomical Effects of Complement Cascade Inhibitor CSM.D.1: Implications for Schizophrenia Risk

Schizophrenia is a leading cause of disability in the world, affecting over 2.5 million Americans today. Individuals suffering from schizophrenia experience a variety of symptoms including positive (i.e. hallucinations, delusions), negative (i.e. flatten affect) and cognitive deficits (i.e. working memory loss). The pathological hallmark of schizophrenia is the reduction of synaptic connections in specific areas of the brain but the mechanism remains unclear. One model, the Feinberg Hypothesis, proposes that aberrations in synaptic refinement can lead to schizophrenia. Recent evidence has implicated immune molecules from the complement cascade system that have been found to play a central role in synaptic refinement. One of the strongest genes associated with increased schizophrenia risk is the CUB and Sushi Multiple Domain 1 (CSM.D.1) gene and is a potential complement inhibitor but its function and role in synaptic refinement is unknown. We predict that altering CSM.D.1 activity will lead to changes in behavior and synaptic connections. As evidence grows in support of the Feinberg hypothesis, this study is important in determining the generalizability of this model, shedding light on the extent to which altered immune pathways in the brain can play a role in the production of complex neurological diseases.

### SAMANI UPADHYAY

Home Institution and State: **Brown University, RI** Email: **samani\_upadhyay@brown.edu** Undergraduate Academic Level: **Senior** Undergraduate Major and Expected Graduation Date: **Neuroscience, 2019** Mentors/Advisors at Home Institution: **David Berson, PhD** 

### **ENDURE Trainee Scientific Interest:**

I'm interested in developmental neuroscience, and how small mutations or mishaps at the molecular level can impact macro behavior and structure.

### ENDURE Trainee Career Goals and Plan:

I hope to pursue a M.D./Ph.D. in Neuroscience.

### **ENDURE Trainee Summer Research Experience:**

ENDURE Summer Research Experience Institution: Columbia University

Mentors/Advisors at ENDURE Summer Research Experience Institution: Melissa Lee and Carol Mason, PhD

ENDURE Research Project Title: Excitatory Synaptic Refinement throughout Development of Fragile X Mice

Fragile X Syndrome (FXS) is the most common single gene inherited form of Autism; many FXS patients display hyperactivity, hypersensitivity to sensory stimuli, impaired visuospatial processing, and developmental delay. This project investigates the implications of Fragile X syndrome on morphology of dendritic spines and synapses using antibody staining and confocal microscopy. Since FXS models show disrupted neural circuit formation, we expect there to be defective refinement in our models that are visible through varied synaptic connections.

### SAMANDA VALENTE

Home Institution and State: **Carnegie Mellon University, PA** Email: svalente@andrew.cmu.edu Undergraduate Academic Level: **Junior** Undergraduate Major and Expected Graduation Date: **Neuroscience – Neurobiology, May 2020** Mentors/Advisors at Home Institution:

### **ENDURE Trainee Scientific Interest:**

I am very interested in the molecular biology side of neuroscience. I like understanding how things work at the molecular level and later looking at how it can affect the system as a whole, especially in terms of behavior.

### ENDURE Trainee Career Goals and Plan:

As of now, I am trying to decide what graduate path is best for me. I know I want to be in a field where I'm able to help people and contribute to science somehow.

### **ENDURE Trainee Summer Research Experience:**

ENDURE Summer Research Experience Institution: Washington University in St. Louis

Mentors/Advisors at ENDURE Summer Research Experience Institution: Sabin Nettles and Harrison Gabel, PhD

# ENDURE Research Project Title: Studying the role of Topoisomerase II Beta mutation in neurodevelopmental disease

Mutations in gene regulatory proteins have been found to be a major underlying cause of intellectual disability and neurodevelopmental disorders. One class of genes that have been identified as crucial for neuronal function are long genes (>100,000). Long genes expressed in neurons are important normal neurophysiology and synapse formation. These longs genes often become supercoiled, which must be resolved for transcription. Topoisomerase II-Beta (TOP2B) resolves coils by breaking and re-ligating two strands of DNA that have become tangled, and this activity has been shown to be important for expression of very long genes in neurons. Notably, a recent exome sequencing study has identified a His58Tyr mutation in TOP2B in a patient exhibiting severe developmental delay and learning disabilities, suggesting that disruption of TOP2B may drive neuronal dysfunction in disease. This project aims to determine the effects of the His58Tyr TOP2B mutation on protein expression and protein function in vitro. I hypothesize that the His58Tyr mutation leads to a deficit in protein function that leads to downregulation of long genes. To test this hypothesis, we have generated the His58Tyr mutation into the homologous sequence of the mouse TOP2B protein and expressed it in HEK 293T cells. We have used Western Blot to examine expression of the mutant protein and Rapid Approach to DNA Adduct Recovery (RADAR) assay to determine protein activity. Western Blot Analysis of the mutant TOP2B protein indicates near normal expression of the protein. Preliminary data for the RADAR assay suggests increased enzymatic activity of the mutant TOP2B versus the wildtype. These results could suggest that the His58Tyr mutation results in gain of function of TOP2B enzymatic activity.

### ENDURE TRAINEE INFORMATION AND RESEARCH ABSTRACTS

## **BP-ENDURE AT HUNTER COLLEGE**

#### HUNTER COLLEGE

Principal Investigator: *Dr. Mariann Weierich* Principal Investigator: *Dr. Glenn E Schafe* Partner Institution: New York University

#### PROGRAM DESCRIPTION:

Hunter College of the City University of New York (CUNY) recognizes that increasing the number of highly qualified neuroscientists from these underrepresented populations is integral to our future as an academic and research institution. Hunter College aims to increase the number of well-trained, diverse neuroscientists. The overall goal of this application is to develop a neuroscience training program at Hunter that will encourage and prepare students from diverse backgrounds to enter into and succeed in Ph.D. programs in the neurosciences.

Hunter has developed a research-educational partnership with four outstanding T32- awarded universities: New York University, Brown University, University of Michigan, and Vanderbilt University. This partnership will expose 12 BP-ENDURE-trainee students per year to a researchintensive curriculum and an environment of excellence and active research. Moreover, because of the diversity of the proposed mentors, students will be exposed to a broad spectrum of researchers, including basic neuroscientists interested in central nervous system (CNS) issues and applied neuroscientists from the areas of clinical, social, health, developmental, and cognitive neuropsychology.

To achieve our goals, the following aims are proposed: (1) to develop an outstanding group of undergraduate students with diverse backgrounds dedicated to neuroscience research; (2) to provide scientific skill and research experiences to our trainees through research placement with actively funded neuroscientists; (3) to develop academic development and curriculum enhancement activities rooted in the student's research activities; (4) to maintain an effective Administrative Core to support our students' needs and development.

Our measurable objectives during the requested funding period include: (1) 85 to 90% acceptance of trainees to graduate school programs in neuroscience; (2) improvement of our students in quantitative skills and academic achievements, as well as their (3) scientific writing and oral presentations. Outcome from evaluations of the Steering Committee, the external evaluator, and the Administrative Core will guide future modifications to our training initiatives.

#### ADDITIONAL PROGRAM TEAM MEMBERS:

Dr. Chiye Aoki – Program Director, New York University Dr. Heather McKellar – Program Manager, New York University Kizzy Vazquez - Program Administrator, Hunter College

### **ESTEPHANIE BALBUENA**

Home Institution and State: Hunter College, NY Email: tsteph815@gmail.com Undergraduate Academic Level: Junior Undergraduate Major and Expected Graduation Date: Psychology, Spring 2020 Mentors/Advisors at Home Institution: Mariann Weierich, PhD

### **ENDURE Trainee Scientific Interest:**

My primary scientific interest is to better understand the involvement of different neural networks in the human brain underlying stress-related disorders. I am particularly interested in how the brain's salience network and central executive network function in relation to the physiological symptoms associated with stress-related and internalizing disorders. The use of functional magnetic resonance imaging techniques has afforded me the opportunity to study the relationship between brain activation and the hypothalamic-pituitary-adrenal axis. I plan to further investigate how stress responses regulated by the salience network impact cognitive function and influence emotionally-valenced tasks.

### ENDURE Trainee Career Goals and Plan:

I hope to pursue a doctoral degree in translational clinical neuroscience. I am interested in understanding the etiology of psychopathology associated with neurological conditions that arise from brain injuries or injury to the central nervous system. Researching psychopathology from this perspective will also allow me to identify different biological factors that impact the development of these disorders. Ultimately, figuring out the similarities and differences between psychopathology that results from injury and psychopathology with psychological etiology, will allow us to better differentiate between the two and develop treatments that are more efficient.

### **ENDURE Trainee Summer Research Experience:**

ENDURE Summer Research Experience Institution: University of Michigan

Mentors/Advisors at ENDURE Summer Research Experience Institution: Christopher S. Monk, PhD

# ENDURE Research Project Title: Increased cortisol response and amygdala activation during an fMRI facial expressions task

An increasing number of studies using magnetic resonance imaging (MRI) techniques provide insight into the neural underpinnings of the relationship between stress and emotion processing. However, little is known about how the scanning environment may influence the processing of emotional stimuli. A total of 153 adolescents (82 female) ages 15 to 17, from predominantly low-income backgrounds, completed a 10-minute fMRI task comprised of five different facial expressions (sad, happy, neutral, angry, fear) that were each presented twenty times (100 trials total). Participants were instructed to identify the gender of the person presented on screen. In addition, participants provided salivary cortisol samples pre- and post-MRI scan. Youth who had increased cortisol from pre- to post-MRI scan, consistent with heightened hypothalamic-pituitary-adrenal (HPA) axis stress response, showed greater right amygdala activation to neutral faces when compared to happy faces. Our finding suggests that stress-related HPA-axis reactivity during an MRI scan may influence performance on emotionally valenced tasks. Further, the data suggest that when in a higher stress state neutral face stimuli might be interpreted as negative, due to their ambiguity. Future studies should measure the stress response to the MRI scan to better understand the processing of emotional information in adolescents.

## **RODRIGO DE LA TORRE**

Home Institution and State: New York University, NY Email: rd1913@nyu.edu Undergraduate Academic Level: Senior Undergraduate Major and Expected Graduation Date: Neuroscience, May 2019 Mentors/Advisors at Home Institution: Jayeeta Basu, PhD, Margarita Kaplow, PhD, and Chiye Aoki, PhD

### **ENDURE Trainee Scientific Interest:**

I was attracted to Neuroscience after taking AP Psychology in high school; I thoroughly enjoyed the latter but felt compelled to take on the challenge of understanding the mechanics behind the brain's functions in addition to its external manifestations. I am particularly interested in the neural processes of learning: including its development throughout one's life and the deterioration caused by neurodegenerative diseases. What kinds of factors influence and improve the efficiency of memory acquisition? How can we maintain this memory and protect it from deterioration at the molecular level?

### ENDURE Trainee Career Goals and Plan:

After my Ph.D. I look forward to contributing, through further research, to our understanding of the creation of memory and degenerative factors that mitigate its effectiveness. One of the greatest rewards, however, would be to teach this to college students and expand the interest in neuroscience, hopefully recruiting more bright minds to tackle the difficult questions that the human brain poses for us. Perhaps the information I derive from research on learning can not only enrich the academic literature on the topic, but it will hopefully serve to improve pedagogy in order to maximize efficiency and diminish intellectual inequality.

### **ENDURE Trainee Summer Research Experience:**

ENDURE Summer Research Experience Institution: Brown University

Mentors/Advisors at ENDURE Summer Research Experience Institution: Jeremy Lins and Anne Hart, PhD

# ENDURE Research Project Title: C. elegans Knock-in ALS Models: Characterizing Pathology and Creating Higher Throughput Assays

Amyotrophic lateral sclerosis (ALS) is a late-onset fatal neurodegenerative disease of the upper and lower motor neurons. Mutations in superoxide dismutase (SOD1) account for 20% of the patients with a familial history of ALS. These mutations may sensitize neurons to additional stressors or genetic mutations that may impair the cellular proteostasis machinery. Previous results in our lab showed improper phenotypic expression of rol-6 gene in transgenic *C. elegans* carrying the knock-in ALS-associated sod-1 mutation, G85R, and the GFP-expressing transgene, vtls1. Here, we propose a novel genetic screen to identify suppressors of ALS SOD1 toxicity in animals with improper rol-6 expression. We further explored the impact of ALS associated mutations on *C. elegans* behavior in two other genetic ALS models.

## AZIZ ELBASHEIR

Home Institution and State: Hunter College, NY Email: aelbasheir3@gmail.com Undergraduate Academic Level: Senior Undergraduate Major and Expected Graduation Date: Psychology, May 2019 Mentors/Advisors at Home Institution: Amber Alliger, PhD

### **ENDURE Trainee Scientific Interest:**

I have increasingly become interested in neuroimmunology focusing on stress disorders. Specifically, I want to explore the roles various adaptive immune cells play in depressive episodes. With this research, I hope to investigate the immunological mechanisms in the brain and offer a more comprehensive understanding of physiological responses in relation to psychiatric disorders.

### **ENDURE Trainee Career Goals and Plan:**

I intend to pursue a Ph.D. in neuroscience in which I'd focused my thesis project on neuroimmunology and its influence on depression. Ultimately, I plan on starting my own lab within an academic institution to focus on previous work done during my time as a Ph.D. student and postdoc. Aside from research, I'd enjoy holding a faculty position to afford me the opportunity to teach undergraduates and/or graduate students.

### **ENDURE Trainee Summer Research Experience:**

ENDURE Summer Research Experience Institution: New York University

Mentors/Advisors at ENDURE Summer Research Experience Institution: Virginia García-Marín, PhD

#### ENDURE Research Project Title: Thalamic Input into PV-ir Neurons in Layer 4C of the Macaque

Limited knowledge on human CNS circuitry has led to the utilization of various animal models to better understand the CNS schematic. We studied the thalamocortical circuit in the macaque, which focused on synaptic density from the lateral geniculate nucleus (LGN) onto the parvalbumin (PV)-ir neurons in layer 4C of the primary visual cortex (V1). Specifically, we analyzed the pathways into layer 4C $\alpha$  and 4C $\beta$ , through quantification of the vesicular glutamate transporter 2 protein (VGluT2) at the axon terminals of LGN afferents onto the soma of PV neurons. Ten neurons were chosen in 4C $\alpha$  and 4C $\beta$  using three different monkeys (n=30). Examination of these neurons were done through 3D-confocal and 3D electron microscopy imaging. On average, there were seven boutons/soma in layer 4C $\beta$  as compared to 2.5 boutons/soma in 4C $\alpha$ . However, soma volume was greater in 4C $\alpha$  (M = 403 µm3) compared to 4C $\beta$  (M = 247 µm3). Therefore, the number of boutons were not related to soma size. Additionally, combined with previous studies involving V1 of mice, we found an estimated value of 14 synapses/soma in layer 4C $\beta$ . These data corroborate estimated synaptic density from previous data, offering a more comprehensive understanding of V1 thalamocortical circuitry.

### **KATHERINE FURMAN**

Home Institution and State: New York University, NY Email: kf1239@nyu.edu Undergraduate Academic Level: Senior Undergraduate Major and Expected Graduation Date: Neural Science, May 2019 Mentors/Advisors at Home Institution: Chiye Aoki, PhD, Mariann Weierich, PhD, and Glenn Schafe, PhD

### **ENDURE Trainee Scientific Interest:**

My scientific interest lies in the neural circuitry behind motivated behaviors. I am interested in the neural representation of motivation on both a circuit and molecular level, and how alterations in such systems lead to maladaptive behaviors such as mental illness, including depression and addiction. These pathologies are characterized by conscious engagement in behaviors which are detrimental to one's own success. I seek to understand the factors which underlie motivation in neurotypical individuals, and understand the maladaptive response exhibited by mentally ill individuals.

### ENDURE Trainee Career Goals and Plan:

My undergraduate research experiences through the ENDURE Program have helped me understand what it means to pursue a career in research and realize that it is something I love. After graduating from New York University with a B.S. in Neural Science, I plan to attend a neuroscience graduate program and earn my Ph.D. in Neuroscience. After this, I would like to eventually become a university professor and have the opportunity to stay involved with research, and to mentor and guide students interested in similar careers.

### **ENDURE Trainee Summer Research Experience:**

ENDURE Summer Research Experience Institution: Yale University

Mentors/Advisors at ENDURE Summer Research Experience Institution: Marina R. Picciotto, PhD, and Steven T. Pittenger, PhD

#### ENDURE Research Project Title: In-vivo optical recording of BLA inhibitory interneuron activity during stressrelated behaviors

Major Depressive Disorder (MDD) involves a maladaptive response to stress, inhibiting the ability of an animal to engage with their environment. Basolateral amygdala (BLA) principal neuron (PN) output is critically involved in mediating resilience to such stress-induced behaviors. This could be the result of direct changes in PN activity, or of modulation of GABAergic interneurons forming local inhibitory circuits within the BLA. The BLA contains inhibitory interneurons of three different types – Parvalbumin (PV), Somatostatin (SOM), and Vasopressin Intestinal Peptide (VIP) – all of which are involved in an inhibitory microcircuit which influences activity of BLA PNs. Using transgenic mice expressing Cre-recombinase under the control of PV, SOM, or VIP promoters, we infused CRE-dependent AAV-GCaMP6s unilaterally into the BLA followed by implantation of a fiber optic cannula and obtained fiber photometry recordings from each interneuron subpopulation in the BLA. Fiber photometry recordings of each interneuron subtype were taken in awake, behaving animals during stress-induced behaviors, including the light/dark box (LD), tail suspension test (TST), and fear conditioning (FC) behaviors. Behavior-dependent activity patterns of SOM and PV interneurons were observed during TST and FC behaviors, but not LD. This suggests an effect of BLA inhibitory microcircuit activity on engagement in stress-induced behaviors.

### **RUFINA KAMALETDINOVA**

Home Institution and State: Hunter College, NY Email: rufina.kamaletdinova34@myhunter.cuny.edu Undergraduate Academic Level: Junior Undergraduate Major and Expected Graduation Date: Biology, June 2020 Mentors/Advisors at Home Institution: Allyson K. Friedman, PhD, Glenn E. Schafe, PhD, and Adrienne Alaie, PhD

### **ENDURE Trainee Scientific Interest:**

I have joined the laboratory of Dr. Allyson Friedman at Hunter College, where I intend to pursue studies related to the question of how social factors impact neural circuit responses to stress and influence susceptibility/resilience to depression.

### ENDURE Trainee Career Goals and Plan:

I am planning to pursue a graduate degree in neuroscience after graduation and hope to ultimately become a faculty member at a major research university. My area of interest lies mainly in evaluating novel (and targeted) pharmacological and non-pharmacological treatments for mood disorders, MDD, in particular.

### **ENDURE Trainee Summer Research Experience:**

ENDURE Summer Research Experience Institution: Vanderbilt University

Mentors/Advisors at ENDURE Summer Research Experience Institution: Danny G. Winder, PhD, and Anel A. Jaramillo, PhD

# ENDURE Research Project Title: The Effect of Forced Alcohol Abstinence- and Stress-Induced Negative Affect on Cocaine-Induced Conditioned Place Preference

Depression is a mental illness that is a leading cause of disability in the United States and worldwide and is often comorbid with drug addiction. However, the question of how a combination of previous drug-exposure and depression affect the rewarding effects of a novel drug remains to be fully understood. The goal of our study was to investigate whether a negative affect state induced by a recent history of chronic alcohol exposure followed by a period of chronic stress produces a modified response to the rewarding effects of cocaine. Specifically, we examined the impact of an alcohol-withdrawal and stress-induced negative affect state on cocaine preference in mice. We hypothesized that mice with a recent history of alcohol and stress exposure would exhibit a depression-like phenotype and would have a stronger preference for a cocaine-associated context. To induce a negative affect state composed of both depressive- and anxiety-like symptoms, mice underwent a chronic period of intermittent alcohol exposure for 2 weeks, followed by a period of forced abstinence. During the alcohol withdrawal period, mice underwent 4 days of exposure to restraint stress, and a novelty-suppressed feeding test (NSFT) was used to assess affective state. After the desired phenotype was established, mice were exposed to cocaine conditioned place preference (CPP) training followed by testing for preference for the cocaine-associated context.

## SACHA McELLIGOTT

Home Institution and State: New York University, NY Email: sacha@nyu.edu Undergraduate Academic Level: Senior Undergraduate Major and Expected Graduation Date: Neural Science, January 2019 Mentors/Advisors at Home Institution:

### **ENDURE Trainee Scientific Interest:**

I am interested in the intersection between neurophysiology and perception – uncovering and generalizing mechanisms that contribute to our perception of the outside world.

### **ENDURE Trainee Career Goals and Plan:**

I hope to one day be a professor of neuroscience, conducting research in either systems or cognitive neuroscience. I hope to continue to engage my interest in teaching and outreach.

### **ENDURE Trainee Summer Research Experience:**

ENDURE Summer Research Experience Institution: Brown University

Mentors/Advisors at ENDURE Summer Research Experience Institution: Michael Paradiso, PhD

ENDURE Research Project Title: The role of saccadic eye movements in visual perception

Despite our experience of perceptual stability, our eyes are constantly in motion, darting around in subtle movements called saccades about three times a second. Saccades are used to sample important visual information from our environment, by quickly directing the fovea to relevant stimuli. It has been hypothesized that the brain's visual system receives a copy of the motor signal used generate the saccade, and past studies have characterized perceptual changes that occur during saccade preparation, yet the anatomical regions that drive such changes remain elusive. In this study, we attempted to uncover a candidate region by selectively tampering with the physiology of human primary visual cortex (V1) during a visual task using transcranial magnetic stimulation (TMS). Subjects were run on a psychophysical discrimination task in which they compared the contrasts of two spatially and temporally segregated Gabor stimuli. We delivered rapid, single TMS pulses to one hemisphere of subjects during the task at various points relative to their saccade to the second stimulus. Using the separation between the psychometric curves for trials with stimuli on a specific side, we showed that subjects perceived higher stimulus contrast for stimuli in the affected hemifield only when the TMS delivery was within ±75ms of the saccade, findings that suggest that V1 contributes to saccade based perceptual changes. This study contributes further to our understanding of how perceptual changes lead up to saccades and elucidates another link in the chain between physiology and perception.

### **ITZIK NAHMOUD**

Home Institution and State: Hunter College, NY Email: itzik.nahmoud63@myhunter.cuny.edu Undergraduate Academic Level: Senior Undergraduate Major and Expected Graduation Date: Biochemistry, Spring 2019 Mentors/Advisors at Home Institution: Ekaterina Likhtik, PhD

### **ENDURE Trainee Scientific Interest:**

In Dr. Ekaterina Likhtik's systems neuroscience lab at Hunter College I am investigating the neural circuitry which is possibly responsible to bring about anxiety and anxiety disorders. All the while, in researching this phenomenon I help encode, integrate and independently use Pavlovian conditioning paradigms to ultimately investigate anxiety behavior in mice as imparted by possible human intervention of the appropriate circuitry. Furthermore, to supplement my awareness of the brain's inner workings I have combined my passion for neuroscience and a curiosity about oncology in Dr. Michael Cooper's lab at Vanderbilt University by researching how human grade III anaplastic astrocytomas develops. In this lab I have gained an expanded skill set in utilizing immunofluorescence techniques to aid in mapping a newfound mosaic of cell functions which may lead to much-needed developments of targeted therapeutics. In light of these experiences I continue my interest in the basic science research of neuroscience while gaining exposure to various subdisciplines such as oncology or neuroeconomics.

### ENDURE Trainee Career Goals and Plan:

To matriculate into an M.D./Ph.D. program whereby I will conduct basic science research and apply my findings in a translational setting. Neuroscience research allows me to actively investigate the brain's evermysterious neural anatomy while using some of the most sophisticated technological updates into modern laboratories and aim to continue on this path. A medical scientist career affords me the rare opportunity of discovering novel approach that could be brought to patients, a liaison for basic science and patient care.

### **ENDURE Trainee Summer Research Experience:**

ENDURE Summer Research Experience Institution: Yale University

Mentors/Advisors at ENDURE Summer Research Experience Institution: Ifat Levy, PhD

# ENDURE Research Project Title: Decision Making under Stress & Uncertainty: Behavior and Physiology Correlates

How our internal state is merged with our visual perception of an impending threat to drive adaptive decision making is not known. Previous research has demonstrated that pupillary responses to ongoing stimuli, an indicator of arousal known to be relevant for memory formation, is a reliable predictor of memory formation for these stimuli. Yet, the physiology and predictive power of ongoing pupillary fluctuations towards conditions of uncertainty, towards conditions of chronic stress, or that of resting states remain unexplored. Monitoring pupillary dynamics during a decision-making task with and without a cold-press stressor revealed that pupillary fluctuations may be a better biomarker of arousal state compared to mean dilation, which is commonly used. These results can help provide a basis for understanding how dysregulation of adaptive perception and attention to relevant sensory cues manifest in maladaptive daily decision making that lead to outcomes such as failed diets, obesity, and eating disorders. Here we demonstrate that uncertainty attitudes and pupillary dynamics during an active decision-making task are altered by conditions of acute stress. This proposal integrates the effects of stress on perception and decision making and provides exciting new perspectives for research on stress and cognition.

### **ARIEL NIEVES**

Home Institution and State: Hunter College, NY Email: Arielnieves@optonline.net Undergraduate Academic Level: Senior Undergraduate Major and Expected Graduation Date: Psychology, May 2020 Mentors/Advisors at Home Institution: Amber Alliger, PhD, and Peter Serrano, PhD

### **ENDURE Trainee Scientific Interest:**

Animals from an enriched environment may be more sufficient in producing models for pharmaceutical research. In Dr. Alliger's Lab at Hunter College I study the effects of stress and environmental enrichment on cognitive function in rats. We focus on the effects of these conditions on the hippocampus and, more recently, microglial and astrocytic activity due to neuroinflammation.

### **ENDURE Trainee Career Goals and Plan:**

When I attend graduate school, I am interested in being a part of a lab where I can explore the underlying physiological and molecular pathology facilitating neurodegenerative diseases and/or behavioral pharmacology for my thesis. I find that the current animal models for neurodegenerative diseases and some behavioral assays are insufficient for their purpose and aim to one day improve their validity.

### **ENDURE Trainee Summer Research Experience:**

ENDURE Summer Research Experience Institution: Vanderbilt University

Mentors/Advisors at ENDURE Summer Research Experience Institution: Anne Taylor, Carrie A. Grueter, PhD, and Brad A. Grueter, PhD

# ENDURE Research Project Title: N-Methyl-D-Aspartate Receptor Dependent Consequences of a High Fat Diet on Depressive-Like Behavior

High fat diets (HFD) are likely contributing to a rising worldwide epidemic of depression and obesity. N-Methyl-D-aspartate receptors (NM.D.AR) in the nucleus accumbens (NAc), an influencer of mood and reward-related behaviors, are implicated in depressive behavior. We hypothesized animals on HFD would display increased depressive-like behavior in an NM.D.AR-dependent manner. We tested the necessity of NM.D.AR function in the NAc involved in the expression of depressive-like behaviors, by pharmacological blockade [ketamine]. We then tested for the development of depressive-like behaviors, by genetic deletion. Female tdTomato mice (N=20) were given either HFD or regular chow for 10 days. Mice were further separated into cohorts determining injection of saline or ketamine, an NM.D.AR antagonist, prior to each assay to assess depressive-like behavior. NAc enriched tissue was collected for RT-qPCR to evaluate gene expression of pro-inflammatory markers. We found significant increases of depressive-like behavior in ketamine injected animals. A second set of experiments used *Grin-1* mice and using the Cre-lox system, *Grin-1* gene expression was specifically knocked down in the NAc. There was no significant difference in behavior. Future directions are considering different behavioral assays and evaluating gene expression of neuroinflammatory markers in the NAc due to comorbidity between HFD, depression, and neuroinflammation.

## ALEC SEIDENBERG

Home Institution and State: Hunter College, NY Email: alecseidenberg@gmail.com Undergraduate Academic Level: Senior Undergraduate Major and Expected Graduation Date: Biology conc. Behavioral Neurobiology, Dec 2018 Mentors/Advisors at Home Institution: Allyson Friedman, PhD

### **ENDURE Trainee Scientific Interest:**

I am interested in the brain mechanisms underlying various forms of psychopathology. I'm particularly interested in using animal models to investigate the formation and function of neural circuits in the developing nervous system to identify dysfunction associated with neuropsychiatric disorders.

### ENDURE Trainee Career Goals and Plan:

Neuroscience could, and should, provide novel ways to investigate psychopathology, improve assessment procedures, and elucidate the biological factors predicting, precipitating, and precluding the onset of psychiatric disorders. Pursuing doctorate studies aimed at understanding the biological underpinnings of neuropsychiatric dysfunction will afford me the opportunity to investigate the biological factors associated with psychopathology in an attempt to identify novel treatment approaches.

### **ENDURE Trainee Summer Research Experience:**

ENDURE Summer Research Experience Institution: Brown University

Mentors/Advisors at ENDURE Summer Research Experience Institution: Kevin Bath, PhD

# ENDURE Research Project Title: The effects of early life stress on reward processing and depressive-like behavior in male and female mice

Exposure to Early Life Stress (ELS) increases risk for depression and may impact reward processing. Depression is sexually dimorphic, affecting women nearly twice as often as men. However, the biological underpinnings of this sex difference remain poorly understood. To investigate the effects of ELS on reward processing and depressive-like behaviors, we induced ELS in a mouse model by limiting a dam's access to bedding and nesting materials. Offspring were then tested using the light dark box (LDB), the forced swim test (FST) and the novelty-induced hypophagia (NIH) test. We hypothesized that ELS-exposed females would exhibit increased depressive-like behavior and differences in reward processing, due in part to ELS-induced upregulation of striatal D2 and D4 receptors. To test this, we attempted to rescue the ELS-associated increase in depressive-like behavior with the dopamine D4 antagonist sonepiprazole. We found that female mice injected with sonepiprezole showed reduced latency to enter the light side in the LDB, approached and consumed less food in the NIH test, and exhibited greater immobility in the FST relative to males. We are currently running additional conditions to determine whether this effect is causally related to the experience of ELS. Our findings may elucidate potential biological mechanisms underlying ELS-associated pathology, mechanisms supporting sex selective risk, and identify novel pathways for intervention.

## **DESTINEE SEMIDEY**

Home Institution and State: Hunter College, NY Email: dsemidey96@gmail.com Undergraduate Academic Level: Junior Undergraduate Major and Expected Graduation Date: Chemistry, Spring 2020 Mentors/Advisors at Home Institution: Ekaterina Likhtik, PhD

### **ENDURE Trainee Scientific Interest:**

My main interest is to understand the underlying biomolecular mechanisms that contribute to neural development/ plasticity and how changes to these systems can alter optimal signaling and development to particular areas of the brain that can potentially lead to the arise of psychiatric and mood disorders. Seeking to elucidate the neural mechanisms in the pathways associated with psychiatric disorders and how they deviate from the neural pathways that are considered typical function.

### ENDURE Trainee Career Goals and Plan:

I plan on pursuing doctorate studies in Molecular Neuroscience to further expand my own knowledge as well as the scientific community's current knowledge of the neuroscience field. In the long term I hope to become a well-established scientist and potentially become the Principal investigator of my own lab.

### **ENDURE Trainee Summer Research Experience:**

ENDURE Summer Research Experience Institution: University of Michigan

Mentors/Advisors at ENDURE Summer Research Experience Institution: Huda Akil, PhD, Stanley J. Watson, MD, PhD, and Angela M. O'Connor, PhD

# ENDURE Research Project Title: Heparan sulfate proteoglycan expression varies in the hippocampus and amygdala of animal models for mood disorders

Patients with major depressive disorder show decreased fibroblast growth factor 2 (FGF2) in the hippocampus. Sprague-Dawley rats were bred based on locomotor activity to develop bred High Responder (bHR) and bred Low Responder (bLR), models for externalizing and internalizing mood disorders, respectively. Meta-analysis of bLR/bHR expression data demonstrates differential levels of the FGF2 coreceptors known as heparan sulfate proteoglycans (HSPGs). P14 is a critical period for emotional processing centers while adults show long term changes in brain glycomes. In this study, P14 and adult animals were assessed for HSPGs through in situ hybridization using S35 probe. bLR rats express high levels of the HSPG Glypican-1 and bHR express high levels of the HSPG Syndecan-4. Outbred rats were examined to profile "normal". Amygdala Glypican-1 expression in the outbred animals was similar to bLRs and similar to bHRs in the hippocampus. The analysis of Syndecan-4 is ongoing. Neurocan, a proteoglycan involved in perineuronal nets (PNNs), also demonstrates differential expression in a meta-analysis, suggesting its role in mood disorders. Further analyses are required, but manipulation of proteoglycan levels may alter behavior and serve as a therapeutic target for mood disorders, like major depressive disorder.
## JORDY SEPULVEDA

Home Institution and State: Hunter College, NY Email: jordysepulveda93@gmail.com Undergraduate Academic Level: Senior Undergraduate Major and Expected Graduation Date: Biological Sciences, June 2019 Mentors/Advisors at Home Institution: Maria E. Figueiredo-Pereira, PhD

### **ENDURE Trainee Scientific Interest:**

My drive is to understand the molecular mechanisms involved in aged related neurodegenerative disorders, focusing primarily in the study of microglial cells, the resident myeloid cells in the central nervous system, and their effect on neuronal homeostasis, as well as in the pathogenesis and exacerbation of neurodegenerative disorders. The significance of studying the processes carried out by microglia during neuronal degeneration is to elucidate targets to trigger a microglial response against protein aggregation pathologies, aging, and other neurodegenerative disorders.

### ENDURE Trainee Career Goals and Plan:

Upon graduating from Hunter College, my goal is to pursue doctorate studies in the field of neurosciences; training and investigating the molecular mechanisms involved in microglia-neuron communication in normal and pathological central nervous system. Once I obtain my doctoral degree, I hope to apply my expertise in microglial biology in the academic field or the private sector.

### **ENDURE Trainee Summer Research Experience:**

ENDURE Summer Research Experience Institution: Yale University

Mentors/Advisors at ENDURE Summer Research Experience Institution: Arie Kaffman, MD, PhD

# ENDURE Research Project Title: Efficient Depletion of Postnatal Microglia by Cre-mediated Expression of Diphtheria Toxin Fragment A

Microglia are specialized immune cells in the central nervous system whose role in various neurodegenerative disorders has been studied extensively. However, the function of microglia in guiding myelination, astrocytic maturation, neurogenesis, and axonal growth during the postnatal period remains unclear. To investigate these issues, we developed a method to ablate postnatal microglia in a cell-specific, efficient, and non-toxic manner. We explore this by inducing the expression of the Diphtheria Toxin fragment A (DTA) in microglia at P10 and P13 using mice that express the inducible Cre recombinase from the CX3CR1 promoter (CX3CR1creER/DTA). Here we show that this method causes efficient ablation of microglia at P17 but with no significant changes in the expression of the myelin marker MBP, the synaptic markers PSD95, and Synaptophysin. Understanding this mechanism could allow us to investigate the role of complete ablation of microglia in neuronal development during early life stress.

## ENDURE TRAINEE INFORMATION AND RESEARCH ABSTRACTS

## NEUROSCIENCE RESEARCH OPPORTUNITIES TO INCREASE DIVERSITY (NeuroID)

### UNIVERSITY OF PUERTO RICO RIO PIEDRAS

Principal Investigator: *Dr. Jose García-Arrarás* Principal Investigator: *Dr. Carmen S. Maldonado-Vlaar* Partner Institutions: Interamerican University of Puerto Rico at Bayamon Campus, Metropolitan University, Sacred Heart University of Puerto Rico

#### PROGRAM DESCRIPTION:

Neuroscience Research Opportunities to Increase Diversity (NeuroID) from the University of Puerto Rico Rio Piedras Campus aims to increase the opportunities available for undergraduate students in the area of Neurosciences. The proposal makes use of the strong neuroscience expertise among UPR investigators and fortifies the underlying neuroscience network that joins undergraduate students, island investigators and their collaborators in mainland institutions.

The training program consists of three major components: (1) research experience - An intense research experience during the academic year and a summer experience in a laboratory at an institution in the mainland USA, such as Harvard, Yale, Univ. Colorado Denver, Univ. of Vermont, Northwestern University, Univ. Miami, that have active T32 training grants in neuroscience and/or excellent track record in recruiting and training underrepresented minorities. (2) academic training participation in seminars, workshops and selected courses to enhance their knowledge in neurobiology and understanding of a research career. (3) student development activities — participants will enter a mentoring program that includes community outreach activities, scientific writing and oral presentations and other professional enhancement activities.

The proposed activities together with an established mentoring program with members of the neuroscience community will serve to increase the student competitiveness and enhance their interest in continuing a research career in neuroscience. The NeurolD program will extend the impact of other successful programs at the University of Puerto Rico, not only by focusing on the neuroscience field but also by greatly expanding the number of possible mentors, increasing the pool of available applicants as well as providing an inclusive and broader training program.

### ADDITIONAL PROGRAM TEAM MEMBERS:

Zobeida Díaz Pérez – Program Administrator, UPR Rio Piedras Marimar Velázquez-Vargas – Administrative Assistant, UPR Rio Piedras Dr. Karen Gonzalez - Universidad Metropolitana, SUAGM Dr. Armando Rodríguez - Interamerican University – Bayamón Agda E. Cordero Murrillo – Sacred Heart University of Puerto Rico

## AMANDA ANQUEIRA

Home Institution and State: University of Puerto Rico Rio Piedras, PR Email: amanda.anqueira @upr.edu Undergraduate Academic Level: Junior Undergraduate Major and Expected Graduation Date: Biology, June 2020 Mentors/Advisors at Home Institution: Alfredo Ghezzi, PhD

### **ENDURE Trainee Scientific Interest:**

I am particularly interested in understanding, with the use of the scientific method, the biological bases and mechanisms of cognition and behavior. It would be nice to explore more in depth the biological phenomenon of memory consolidation and learning in response to other factors such as pharmacological substances and the specific cellular mechanisms that encompass such a mysterious phenomenon.

### **ENDURE Trainee Career Goals and Plan:**

My career goals and plans include finishing a bachelor's degree in Cellular and Molecular Biology and once finished, to continue my studies in graduate school with the objective to finish a PhD in Neuroscience. I wish to run a laboratory in the future where I can help understand and expand the knowledge in the field.

### **ENDURE Trainee Summer Research Experience:**

ENDURE Summer Research Experience Institution: University of Puerto Rico Rio Piedras

Mentors/Advisors at ENDURE Summer Research Experience Institution: Alfredo Ghezzi, PhD

### ENDURE Research Project Title: Effect of synaptic gene BRP in alcohol related sleep behaviors

Alcohol exposure is known to trigger a collection of sleep disturbances that alter homeostatic processes. However, the molecular mechanisms behind this phenomenon remain unknown. The gene bruchpilot (brp) is a cytoskeletal protein responsible for maintaining the structural integrity of electron-dense projections at pre-active zones by contributing to Ca2+ channel clustering, size regulation of the synaptic vesicle readily releaseable pool and anesthesia-resistant memory formation in the fly Drosophila melanogaster. This gene in Drosophila is homologous to the human protein ELKS/CAST/ERC. Brp is also involved in the sleep-regulating pathways in Drosophila which makes it a key component for studying the interactions between alcohol exposure and the circadian system. In order to understand the potential role of brp in alcohol induce sleep behaviors, we use the UAS-GAL4 system to knock-down BRP gene expression in sleep regulating neurons and expose these flies to ethanol vapor. As a result, we observed that alcohol induce sleep behaviors are involved with genetic mechanisms that affect neural synapses.

## SHANTEE AYALA-ROSARIO

Home Institution and State: Inter American University of Puerto Rico-Bayamon, PR Email: s.ayala.1997@gmail.com Undergraduate Academic Level: Junior Undergraduate Major and Expected Graduation Date: Biotechnology, 2020 Mentors/Advisors at Home Institution:

### **ENDURE Trainee Scientific Interest:**

During my time as a "poolee" in the Marine Corps, I witnessed how many military members viewed Post-Traumatic Stress Disorder as something the individual can manage. Additionally, hurricane Maria caused an increase of PTSD in my hometown. Therefore, I decided to retract from my enlistment to prioritize my education and aspired to use research to better understand this neurological condition. With this said, I am highly interested in understanding PTSD patients through molecular and behavioral assays and identify the connectivity that produces the fear/anxiety phenotype. More specifically, I am eager to understand how associative memories are regulated in PTSD.

### ENDURE Trainee Career Goals and Plan:

I aim to learn about the captivating field of Neuroscience; specifically, how memories are regulated in Post-Traumatic Stress Disorder. In order to pursue this passion, I am searching for opportunities in which I can grow as a professional, and aspire to obtain a Ph.D. in Neuroscience, yet opt to be open-minded through those professional years. I long to be a well-rounded scientist with great potential in a wide range of disciplines, in order to become an excellent educator and mentor to establish my own research laboratory in the future.

### **ENDURE Trainee Summer Research Experience:**

ENDURE Summer Research Experience Institution: University of Puerto Rico Medical Sciences Campus

Mentors/Advisors at ENDURE Summer Research Experience Institution: Hector Bravo and Gregory Quirk, PhD

### ENDURE Research Project Title: Strategies of Conflict-Based Decision Making

Pursuit of reward and avoidance of adversity are major behavioral motivators. Failure to balance these motivators appropriately results in maladaptive behaviors, which may underlie many pathological conditions. Little is known about how the circuits of these motivators interact to result in adaptive behaviors. We introduced a conflict task where a 30sec tone that co-terminates with a 2s footshock and a light that indicates food availability are presented simultaneously. The rats must choose to avoid shock by stepping onto a platform or press a lever to receive a reward and risk getting shocked. 26% of rats spent all of the time on the platform and never pressed for food. This lack of food seeking is the cost of excessive avoidance. 30% engaged in excessive food seeking, showing little to no avoidance. The footshocks received are the cost of excessive food seeking. Neither of these behaviors is optimal. In contrast, 44% of rats accommodated both food seeking and avoidance behaviors, by timing the occurrence of the shock. These rats increased food seeking during the early portion of the tone and avoided as the tone progressed. These findings revealed naturally occurring sub-groups, characterized by contrasting behavioral responses to threat-reward conflict.

## NORELIS M. DIAZ RODRIGUEZ

Home Institution and State: University of Puerto Rico Rio Piedras, PR Email: norelis.diaz@upr.edu Undergraduate Academic Level: Junior Undergraduate Major and Expected Graduation Date: Psychology, 2020 Mentors/Advisors at Home Institution: Jose L. Agosto, PhD, and Alfredo Ghezzi, PhD

### **ENDURE Trainee Scientific Interest:**

The area in the neuroscience that I'm more interest in developed is cognitive neuroscience especially in the neurodegenerative diseases. I would like to evaluate what biological factor such as genes, neurotransmitter, proteins and vesicles are involved in those diseases and how we could create a new method to stop the immunology system to self-destruct areas of the brain especially in young people.

### **ENDURE Trainee Career Goals and Plan:**

My career goals are to conclude my bachelor's in Psychology and get an SRF before applying for graduate school. Then I'm going to obtain a Ph. D in Neuroscience and become a Principal investigator (PI). Also, I want to create a nonprofit association that promotes sciences in those places that don't have a privileged education.

### **ENDURE Trainee Summer Research Experience:**

ENDURE Summer Research Experience Institution: University of Puerto Rico Rio Piedras

Mentors/Advisors at ENDURE Summer Research Experience Institution: Jose L. Agosto, PhD, and Alfredo Ghezzi, PhD

ENDURE Research Project Title: The effect of chronic sleep deprivation on disc large (DLG) expression

Sleep is a physiological state define by periods of inactivity, low sensory response and homeostasis regulation. Although, numerous studies have been able to provide important insights about the neural circuitry that underlie sleep in Drosophila melanogaster, the specific molecular pathways that orchestrate this neural response remains unknown. In this investigation, we studied Disc large (DLG), a post-synaptic protein that increases in response to acute sleep deprivation. To determine the changes of DLG expression due to chronic vs. acute sleep deprivation in D. melanogaster, we deprived flies from sleep for a period of 12 hours (acute) or 3.5 days. After dissecting the brains, we performed immunofluorescence and western blots to evaluate the DLG expression. Our preliminary studies suggest that, in contrast to acute studies, chronic sleep deprivation decreases DLG expression. These findings suggest that the effect of sleep deprivation on the expression of synaptic proteins is more dynamic than previously thought. Furthermore, these findings suggest that neuronal homeostatic mechanisms may play a key role in the regulation of synaptic proteins and sleep homeostasis.

## SOL FONSECA

Home Institution and State: University of Puerto Rico Rio Piedras, PR Email: sol.fonseca@upr.edu Undergraduate Academic Level: Senior Undergraduate Major and Expected Graduation Date: Psychology, May 2019 Mentors/Advisors at Home Institution: Annabell Segarra, PhD

### **ENDURE Trainee Scientific Interest:**

My goal is to study organic components in joint with neuropharmacology to address different neurological adaptations that surface after psychological trauma. I aim to use these organic components as a means for a natural alternative to regulate the system and eventually propose therapies for individuals fighting with depression, addiction and other neuronal malfunctions.

### **ENDURE Trainee Career Goals and Plan:**

I aim to get a master's in naturopathy and parapharmacy, followed by a Ph.D. in neuropharmacology. I would like to learn old traditions of healing in order to study the natural components and thus, move those components to the lab in search for their healing properties.

### **ENDURE Trainee Summer Research Experience:**

ENDURE Summer Research Experience Institution: Massachusetts Institute of Technology

Mentors/Advisors at ENDURE Summer Research Experience Institution: Laura Schulz, PhD

### ENDURE Research Project Title: Children's understanding of moral reasons

An act can be morally wrong for many different reasons. How do adults and children figure out why a moral transgression is wrong? In Study 1, we presented adults with stories that described a morally wrong act. Subjects were asked to choose one out of nine moral reasons that best explained why the act was wrong. We found a high level of agreement among adults, indicating that adults seem to intuitively know which explanations are applicable to which cases. We hypothesize that children will select the same moral reasons as adults. In Study 2, we aim to see how subjects determine which moral explanation is relevant. We focused on one moral explanation: universalization, or "what if everybody did that?" We identified three conditions that must be present for this moral explanation to apply. We found that when all three conditions were present in a story, subjects tended to judge that action as wrong. When even one condition was absent, subjects were less likely to judge the action wrong. These two studies show that subjects systematically use moral reasons when their application conditions are present in a moral transgression.

## MARCELO FRANCIA

Home Institution and State: University of Puerto Rico Rio Piedras, PR Email: marcelo.francia@upr.edu Undergraduate Academic Level: Senior Undergraduate Major and Expected Graduation Date: Cellular and Molecular Biology, May 2019 Mentors/Advisors at Home Institution: José Luis Agosto, PhD

### **ENDURE Trainee Scientific Interest:**

I am interested in researching the molecular basis of mental conditions such as depression, schizophrenia and bipolar disorder. I believe that a broader understanding of the physical aspects of those conditions will lead to improved and individualized treatments. Currently, my main interest are gut-brain interactions and how they can influence higher brain functions.

### **ENDURE Trainee Career Goals and Plan:**

As an undergraduate senior, I will be applying to Ph.D. programs focused on molecular neuroscience. Eventually, I want to have my own laboratory where I can pursue my scientific questions. Also, I would be giving classes and mentoring the future generation of researchers.

### **ENDURE Trainee Summer Research Experience:**

ENDURE Summer Research Experience Institution: Johns Hopkins University

Mentors/Advisors at ENDURE Summer Research Experience Institution: Alfredo Kirkwood, PhD

# ENDURE Research Project Title: Mechanism of neuronal excitation and inhibition balance disruption in a mouse model of autism

Our brains are thought to constantly maintain a precise balance of excitation to inhibition (E/I ratio). However, previous evidence from our lab has shown that this ratio varies throughout the sleep/wake cycle. A disruption in this balance has been linked to mental conditions such as insomnia, epilepsy, and autism; furthermore, not much is known about how this sleep-dependent E/I regulation can be disrupted. Characterization of the mechanisms disrupted in those disorders could be used to develop more accurate and efficient treatments. Using whole-cell patch clamp recordings of visual cortex layer 2/3 in BTBR mice, which is a mouse model for idiopathic autism, we measured the excitatory/inhibitory ratio at the end of the active phase (zeitgeber time, ZTO) and the rest phase (ZT12). We found that the E/I ratio was lower at the end of the active phase and higher at the end of the rest phase, an inverse pattern to the one found in wild-type mice. To study whether dysregulation of excitation or inhibition underlies this disruption of the E/I balance, we recorded miniature inhibitory postsynaptic currents (mIPSCs) at ZTO and ZT12. Although no difference was found in the amplitude of mIPSCs, results show that wild-type mice have a lower frequency of mIPSCs during the active phase compared to the rest phase, which is a trend that we found reversed on the BTBR mice. This suggests that dysregulation of inhibition underlies the disruption of daily E/I ratio balance in the visual cortex in BTBR mice. To determine whether excitation is also disrupted, we are currently measuring miniature excitatory postsynaptic currents (mEPSCs) at ZTO and ZT12.

## **RUBEN GARCIA-REYES**

Home Institution and State: Metropolitan University, PR Email: rubengarciareyes@gmail.com Undergraduate Academic Level: Senior Undergraduate Major and Expected Graduation Date: Psychology-Biology, 2019 Mentors/Advisors at Home Institution: Jose E. García-Arrarás, PhD

### **ENDURE Trainee Scientific Interest:**

I am very interested in translational neuroscience focusing on the treatment and diagnosis of mental illnesses and the development of new therapeutics that can help patients with these conditions to improve their health.

### **ENDURE Trainee Career Goals and Plan:**

After I graduate, I will be pursuing a Ph.D. in Neuroscience specializing in translational research. I want to have an effect in the clinic while conducting research that drives the discoveries needed to improve the human condition. Hopefully, with the assistance of like-minded people, I am planning to establish a next-gen research institute in the near future.

### **ENDURE Trainee Summer Research Experience:**

ENDURE Summer Research Experience Institution:

Mentors/Advisors at ENDURE Summer Research Experience Institution: Jose E. García-Arrarás, PhD

# ENDURE Research Project Title: Identification and Characterization of the DMBT1 Gene in the Sea Cucumber Holothuria glaberrima

The sea cucumber Holothuria glaberrima is an echinoderm with striking regenerative capabilities in both its nervous and digestive systems. Previous work from our lab has shown that its radial nerve cord can regenerate forming a scarless new cord similar, if not identical, to the injured one. Similarly, the intestine can regenerate from the mesenterial tissues forming a new intestine in less than a month. We have been studying the genes that are upregulated during the regenerative process. One of these genes appear to be the holothurian homolog of deleted in malignant brain tumor 1 (DMBT1). The protein product of this gene, also known as Glycoprotein 340, is encoded in humans by the DMBT1 gene and it was first isolated based on its deletion in a medulloblastoma cell line. A contig was found in our holothurian database that when blasted against the NIH database showed high similarity to the human DMBT1 nucleotide sequence; with this, a putative protein sequence was obtained. The open reading frame of the contig has a length of 1,124 amino acids (aa) whereas the human contains is 1,785 aa in length. Genetic alignments were performed to determine the identity percentage and homology in order to identify the epitope of the protein found in human DMBT1. When compared, 31% of sites were identical while 44.2% share similar properties. We also sequenced regions of the five prime and three prime untranslated regions (UTRs). Geneious was used to complete numerous analyses in order to understand its composition. The identification of this holothurian gene opens up the door for further analyses of regeneration associated genes and to the roles they might be playing in both digestive and nervous system processes.

## JORGE IRAVEDRA

Home Institution and State: University of Puerto Rico Rio Piedras, PR Email: jorge.iravedra@upr.edu Undergraduate Academic Level: Senior Undergraduate Major and Expected Graduation Date: Cell and Molecular Biology, June 2019 Mentors/Advisors at Home Institution: Gregory J. Quirk, PhD, and Maria M. Diehl, PhD

### **ENDURE Trainee Scientific Interest:**

I am interested in investigating the circuit-level mechanisms underlying the regulation of emotions, specifically fear and reward, and social behavior

### ENDURE Trainee Career Goals and Plan:

My goal is to complete a Ph.D. in a behavioral neuroscience lab, then continue on to postdoctoral training. Following this, I intend to pursue a tenure-track position in an academic institution wherein I could work as a principal investigator.

### **ENDURE Trainee Summer Research Experience:**

ENDURE Summer Research Experience Institution: Princeton University

Mentors/Advisors at ENDURE Summer Research Experience Institution: Ilana Witten, PhD, and Scott Bolkan, PhD

# ENDURE Research Project Title: Direct and indirect pathways in the dorsomedial and ventral striatum distinctly regulate memory-guided motor outputs

The appropriate selection of actions is critical for achieving desired outcomes. The striatum is thought to mediate action selection through spiny projection neurons (SPNs), which promote or suppress motor outputs via the direct pathway (dSPNs) or indirect pathway (iSPNs), respectively. However, it remains unclear whether dSPNs and iSPNs directly regulate motor outputs or instead guide decisions towards motor outputs. To address this, we optogenetically inhibited dSPNs or iSPNs in either the dorsomedial striatum (DMS) or the ventral striatum (VS) of mice performing two versions of a virtual-reality task requiring identical outputs but different cognitive demands. In the first, mice rely on a visual guide to produce the appropriate motor output (sensory-guided) whereas, in the second, mice rely on sensory evidence accumulation in working memory to guide the appropriate motor output (memory-guided). Our preliminary findings indicate that inhibition of dSPNs or iSPNs in either the DMS or VS does not affect sensory-guided motor outputs but does alter behavioral performance in the memory-guided task, albeit distinctly. Whereas inhibition of DMS dSPNs and iSPNs produced oppositely biased motor outputs, inhibition of both VS dSPNs and iSPNs decreased sensitivity in psychophysical performance. This suggests that DMS and VS do not directly regulate motor outputs, but rather support distinct operations affecting the decision towards a motor output. Furthermore, whereas the classic model of opposing direct and indirect pathways may extend to memory-guided decision-making for the DMS, the two pathways may serve overlapping functions in the VS.

## CARLOS E MARTINEZ-NAVARRO

Home Institution and State: University of Puerto Rico Rio Piedras, PR Email: carlos.martinez32@upr.edu Undergraduate Academic Level: Senior Undergraduate Major and Expected Graduation Date: Chemistry, May 2020 Mentors/Advisors at Home Institution: Jose Garcia-Arraras, PhD

### **ENDURE Trainee Scientific Interest:**

I am interested in how atoms or chemical compounds, combine and interact in a way that can ultimately result in emergent properties such as the consciousness of a human brain. In a broader sense I am interested in the chemistry of the brain.

### ENDURE Trainee Career Goals and Plan:

As a chemistry major student at the University of Puerto Rico, Río Piedras Campus, my goal is to complete my undergraduate studies and to obtain a Ph.D. in neuroscience so that I can work in scientific research.

### **ENDURE Trainee Summer Research Experience:**

ENDURE Summer Research Experience Institution: Boston University

Mentors/Advisors at ENDURE Summer Research Experience Institution: John White, PhD, Jad Noueihed, Fernando Fernandez, PhD, and Bahar Rahsepar

ENDURE Research Project Title: Recurrent Excitation in the Subiculum of the Hippocampus

The mechanism by which theta waves are generated in the hippocampus is a current subject of interest. The hippocampus is associated with spatial memory and short- and long-term memory consolidation in humans, and in mice its place cells are key to spatial navigation. Theta waves have been proposed to play a major role in these functions. Research regarding generation of theta waves in the CA1 and CA3 regions has been conducted, but the mechanism for theta generation in the subiculum remains less studied. Our goal is to identify how subicular pyramidal cells could generate theta waves via recurrent excitation. Whole cell patch clamping was used to study recurrent excitatory connections of subicular pyramidal cells in Thy1-ChR2 transgenic mice. While the subiculum was stimulated with light pulses in order to induce excitation in pyramidal cells, voltage clamp recordings were used to study synaptic currents in pyramidal cells. Voltage-clamped pyramidal cells were filled with biocytin and conjugated with Alexa Fluor 488 for imaging under a two-photon microscope to anatomically find recurrent connections. Electrophysiological data captured from the optogenetic experiments suggest the existence of recurrent excitatory connections between pyramidal cells in the subiculum.

## **KEVIN NIEVES**

Home Institution and State: San Juan, PR Email: kevinieves24@yahoo.com Undergraduate Academic Level: Senior Undergraduate Major and Expected Graduation Date: Biology/Mathematics, 2020 Mentors/Advisors at Home Institution:

### **ENDURE Trainee Scientific Interest:**

My research interests are focused on central pattern generators and the control of motor behavior: repetitive movements such a locomotion, feeding, and breathing. It would be fulfilling to thoroughly investigate the specific neurotransmitters and modulators that control repetitive motor activity in all nervous systems, including our own. These studies are very important because they will disclose principles that are broadly applicable to adaptative motor activity and to the dysfunctional conditions associated with presently incurable movement disorders, such Parkinson's disease.

### ENDURE Trainee Career Goals and Plan:

When I graduate, I would love to work on investigations about apraxia. The area I have more interest in is called apraxia of speech, a condition that affects the oral-motor mechanism, therefore affecting the production of intelligible speech. I consider this to be a very interesting topic, because most causes for this condition are unknown and can affect the daily life of people. More profound research on the topic is to be made and would be fulfilling to be an active part of that research.

### **ENDURE Trainee Summer Research Experience:**

ENDURE Summer Research Experience Institution: Institute of Neurobiology, UPR Medical Sciences Campus

Mentors/Advisors at ENDURE Summer Research Experience Institution: Mark W. Miller, PhD

# ENDURE Research Project Title: Localization of glutamate-like immunoreactivity in the nervous system of *Biomphalaria glabrata*: an intermediate host for schistosomiasis.

Approximately, ten percent of the worldwide population lives at risk of contracting the parasitic disease, schistosomiasis, popularly known as "snail fever". The digenetic trematode worm species *Schistosoma mansoni*, that is the causative of the most common form of intestinal schistosomiasis, requires the freshwater snail *Biomphalaria glabrata* to serve as its primary intermediate host. Within the snail, *S. mansoni* multiplies and develops into its cercarial stage which can infect humans. The infection of pulmonate snails by larval trematodes has been shown to alter host behavior. For this reason, a commercial antiserum was used (mouse polyclonal) to localize glutamate-like immunoreactivity in the central and peripheral nervous systems of *B. glabrata*. Glutamate-like immunoreactivity (GLUi) was observed throughout the central nervous system (CNS) in form of fibers. GLUi fibers were present in all nerves, connectives and commissures. In addition, clusters of large prominent neurons were found in the left parietal and visceral ganglia. These results suggest that the glutamate serves as a neurotransmitter in *B. glabrata*. Future experiments will explore whether glutamatergic signaling contributes to sensory responses to miracidium penetration or to behaviors that are altered following infection.

## DAVID M. OJEDA

Home Institution and State: University of Puerto Rico Rio Piedras, PR Email: david.ojeda@upr.edu Undergraduate Academic Level: Junior Undergraduate Major and Expected Graduation Date: Interdisciplinary Sciences, 2019 Mentors/Advisors at Home Institution: Demetrio Sierra, PhD

### **ENDURE Trainee Scientific Interest:**

My research interest is in human and comparative cognition with aim in the processes of learning and perception. The understanding of such phenomena demands an interdisciplinary approach that extends to fields such as: neuroscience, cognitive science, psychology, computer science and philosophy. In the field of neuroscience, I strive to gain training in multiple techniques studying the process of how emergent behaviors stem from neuronal circuits and how can these be modified by external and internal states.

### **ENDURE Trainee Career Goals and Plan:**

My career goals are to continue my scientific training with a multidisciplinary perspective. I'm focused in simply learning techniques and working with diverse topics within the field of neuroscience. My ultimate goal would be to achieve a Ph.D. and post-doc in order to become a college professor and work in consciousness research.

### **ENDURE Trainee Summer Research Experience:**

ENDURE Summer Research Experience Institution: University of California San Diego

Mentors/Advisors at ENDURE Summer Research Experience Institution: Edward Vul, PhD

### ENDURE Research Project Title: Price variance and signaling in consumer goods

When male peacocks use their picturesque and extravagant feathers to court females they exhibit a common behavior known as signaling. This kind of behavior is studied in various academic fields such as economics, game theory and psychology. Modern humans tend to signal through "conspicuous consumption" in which economic and social information is communicated by purchasing luxurious and unessential products. However, which goods and services have particularly useful signaling qualities, and how it affects their respective market prices, is still to be determined. Here we conducted an experiment that evaluated the relationship between market price and perceived signal quality of various consumer goods. We asked UCSD undergraduates about the extent to which "people judge others based on this product" in judgments of individual products, pairwise comparisons, and rank orderings of sets of products. These measures can be analyzed using a joint statistical model that estimates a net signaling value for each product.

To test whether product signaling quality has an effect in marketing strategies we scraped prices for each product from online retailers. On the hypothesis that products that are used for signaling will have greater variety of prices we evaluated if the variance of scraped prices is positively correlated to the signaling value of the product. This relationship could possibly explain the rationality behind our current consumer behavior by exhibiting how human cognition interacts with the market. These findings offer a fundamental classification of object signaling that will be relevant for future research in behavioral economics and cognitive science.

## ADRIANA PADILLA

Home Institution and State: University of Puerto Rico Rio Piedras, PR Email: adriana.padilla2@upr.edu Undergraduate Academic Level: Senior Undergraduate Major and Expected Graduation Date: Biology, 2019 Mentors/Advisors at Home Institution: Alfredo Ghezzi, PhD, José Garcia-Arraras, PhD, and Carmen Maldonado, PhD

### **ENDURE Trainee Scientific Interest:**

I wish to understand how neuron cell type identity is modulated at the epigenetic level.

### ENDURE Trainee Career Goals and Plan:

I wish to pursue a doctorate degree in neuroscience where I can create research projects guided towards a clinical application.

### **ENDURE Trainee Summer Research Experience:**

ENDURE Summer Research Experience Institution: University of California San Francisco

Mentors/Advisors at ENDURE Summer Research Experience Institution: Holly Ingraham, PhD, and William Krause, PhD

# ENDURE Research Project Title: Uncovering a subset of hypothalamic neurons that regulate female energy expenditure

Female aging and the consequent decline in circulating estradiol contributes to the development of lateonset obesity. The ventromedial hypothalamus (VMH) regulates metabolic homeostasis, as well as reproduction. Previously, we and others demonstrated that estrogen- receptor alpha (ER $\alpha$ )-expressing neurons in the ventrolateral subregion of the VMH (VMHVL) promote energy expenditure via physical activity and are necessary for body weight maintenance, specifically in females. It remains unclear if and how this estrogen-responsive VMHVL module coordinates this energy balance shift with the signals and circuits in the brain that govern homeostasis. Our preliminary data suggest that increased circulating estradiol upregulates expression of the melanocortin-4 receptor (Mc4r) within the VMHVL. MC4R is a wellknown activator of catabolism, and MC4R mutation causes obesity in humans and mice. Here, we test the hypothesis that these ER $\alpha$ + MC4R+ VMHVL neurons promote energy expenditure in female mice. To confirm Mc4r transcription in response to endogenous estradiol, we analyzed VMHVL Mc4r expression by qPCR. Mc4r is significantly upregulated in the VMHVL of female mice during proestrus, the preovulatory stage characterized by high estradiol, as compared to other estrous cycle stages. To probe the function MC4R+ VMHVL neuron functions we synthetically activated these neurons using Cre-dependent Designer Receptors Exclusively Activated by Designer Drugs (DREADDs) injected. Following chronic DREADDdependent activation, female mice demonstrate heightened locomotion lasting up to 6 hours and weight loss, while also revealing an increase in compulsive-like behavior. Future studies will further uncover the correlation between compulsivity and physical activity.

## LEONARDO RAMOS-RODRIGUEZ

Home Institution and State: University of Puerto Rico Rio Piedras, PR Email: Ieonardo.ramos4@upr.edu Undergraduate Academic Level: Junior Undergraduate Major and Expected Graduation Date: Interdisciplinary st

Undergraduate Major and Expected Graduation Date: Interdisciplinary studies in Natural Sciences, 2020 Mentors/Advisors at Home Institution: Alfredo Ghezzi, PhD

### **ENDURE Trainee Scientific Interest:**

My area of interest in neuroscience must do mainly with synapses and how these are affected by different elements, specifically drugs. Because of this interest in in neuropharmacology I started working in a lab involved with epigenetic changes due to alcohol exposure. This experience has driven me towards the fields of neurogenetics and neuroepigenetics as possible field of research in my pursuit of graduate studies. Because of these interests I am highly interested in effects of drugs in gene expression and its effects on neuroplasticity and in the number of synapses.

### ENDURE Trainee Career Goals and Plan:

After graduating from a Bachelor's degree in Puerto Rico, I plan to apply to a Neuroscience Ph.D program. During this time my goal is to be able to do research focused on neuropharmacology while exploring how the field can incorporate biotechnology. Afterwards I plan to remain in academia by doing a post-doc and eventually becoming a professor.

### **ENDURE Trainee Summer Research Experience:**

ENDURE Summer Research Experience Institution: University of Puerto Rico Rio Piedras

Mentors/Advisors at ENDURE Summer Research Experience Institution: Alfredo Ghezzi, PhD

#### ENDURE Research Project Title: Association between Tip 60 gene and creation of ethanol tolerance in Drosophila melanogaster model

Alcohol tolerance is caused by a set of adaptations that occur in the brain once the organism has been exposed to the drug. These adaptations are triggered by epigenetic processes that alter chromatin structure and gene expression that lead to the development of tolerance. However, the overall epigenetic mechanisms that underly alcohol tolerance remain unknown. Our goal is to study the effect alcohol has on Dmel/Tip60, a gene that codes for a Histone Acetyltransferase (HAT) and regulates gene expression. It has shown to be involved in embryogenesis, neural development and it plays a significant role in generating ethanol tolerance. Using the UAS-Gal4 system, we knock-down gene expression of Tip 60 in the whole fly brain and expose these flies to ethanol for 12 days. We used sedation and recovery from sedation as proxies for alcohol tolerance. As a result, we found that flies without the Tip60 gene could not create tolerance to alcohol. While the control group could create tolerance that would be eventually lost as the days passed, which was what was expected.

## EFRAIN RODRIGUEZ

Home Institution and State: University of Puerto Rico Rio Piedras, PR Email: efrain.rodriguez6@upr.edu Undergraduate Academic Level: Senior Undergraduate Major and Expected Graduation Date: Interdisciplinary Program in Natural Sciences, May 2019 Mentors/Advisors at Home Institution: Annabell C. Segarra, PhD

### **ENDURE Trainee Scientific Interest:**

My scientific interests range from epistemology to integrative physiology. My current interests lie in modulation of the endocannabinoid system by early life stressors. Also in activation of set system by aerobic exercise. Currently the Segarra lab is developing exercise as a method of reducing the behavioral changes elicited by early life stress.

### **ENDURE Trainee Career Goals and Plan:**

After finishing my undergraduate degree my plan is to pursue a master's degree in Cajal Institute of Madrid

### **ENDURE Trainee Summer Research Experience:**

ENDURE Summer Research Experience Institution: University of Puerto Rico Medical Sciences Campus

Mentors/Advisors at ENDURE Summer Research Experience Institution: Annabell C. Segarra, PhD

### ENDURE Research Project Title: Does stress change cannabinoid receptor expression in the hippocampus?

The adolescent brain undergoes developmental changes lasting until late adulthood. Environmental insults during development, such as stress affect cognition, behavior and increase susceptibility to mental illness (Baum & Posluszny, 1999; Burke & Miczek, 2014). Recent reports indicate 40-50% of children are subjected to early life adversity, resulting in altered brain development as well as learning disabilities (Cacioppo, 2015). The Hippocampus, associated with emotional memory processes, is particularly vulnerable to stress induced behavioral changes. Both excitatory and inhibitory synaptic transmission in the hippocampus are modulated by the endocannabinoid molecules. Endocannabinoid receptor 1 (CB1) activation in the hippocampus is thought to mitigate these behavioral manifestations of stress by reducing Hypothalamic-Pituitary-Adrenal (HPA) axis activation. Investigation into the effects of early life stressors such as social isolation in expression of cannabinoid receptor expression is largely unknown. Studies in the Segarra laboratory have found that isolation stress increase anxiety related behavior. Our aim was to investigate the effects of social isolation in CB1 receptor expression in the hippocampus of adolescent female and male rats. After Western Blot protein analysis our preliminary data suggests there exists a trend towards lower CB1 expression in isolated male adolescent as compared to grouped rats.

## MARCOS SANCHEZ NAVARRO

Home Institution and State: Universidad Metropolitana, PR Email: <u>sanchezm1248@gmail.com</u> Undergraduate Academic Level: Senior Undergraduate Major and Expected Graduation Date: Biology 2019 Mentors/Advisors at Home Institution: Gregory J Quirk, PhD

### **ENDURE Trainee Scientific Interest:**

My research interests lie in the overlap between molecular and behavioral neuroscience. I am interested in how differential gene expression in neurons can lead to variations in function and connectivity. I am also interested in studying the effect of abnormal changes in the gene expression of these cells and determining possible long-lasting effects in neuronal activity that can be subsequently perceived in the behavioral phenotype of the affected individual. Therefore, answering questions like how changes in homeostatic needs are sufficient to induce alterations in neuronal activity and behavior are the base of my scientific interest.

### ENDURE Trainee Career Goals and Plan:

I plan to finish my undergraduate studies and to pursue a Ph.D. in neuroscience followed by obtaining a postdoctoral position and eventually establishing my own research laboratory. With these steps completed I plan to work towards fostering neuroscience research in communities with limited research opportunities, specifically Puerto Rico.

### **ENDURE Trainee Summer Research Experience:**

ENDURE Summer Research Experience Institution: University of Puerto Rico

Mentors/Advisors at ENDURE Summer Research Experience Institution: Jose Garcia Arraras, PhD, and Carmen Maldonado Vlaar, PhD

# ENDURE Research Project Title: Basolateral amygdala projections to the nucleus accumbens modulate food seeking motivation under conditions of food deprivation

The basolateral amygdala (BLA) plays a role in the integration of environmental stimuli that predict aversive or appetitive outcomes with signals that indicate internal states and emotional valence. Previous work has demonstrated that specific neuronal subpopulations in the BLA that project to the nucleus accumbens (NAc) or central amygdala (CeM) differentially encode positive or negative valence, respectively. Preliminary electrophysiology data from the lab suggests that these two populations are interconnected and capable of modulating one another's activity; specifically, BLA-->NAc neurons are activated by BLA-->CeM neurons following food deprivation. We hypothesized that, due to the aversiveness of food deprivation and subsequent appetitive responses of food delivery, BLA->NAc neurons would be differentially recruited across satiety states. We addressed these questions with two main techniques: in vivo two-photon (2P) calcium imaging and chemogenetic approaches (Designer Receptors Exclusively Activated by Designer Drugs, DREADDS). Our results show that changes in satiety states are sufficient to induce modulation of calcium activity among BLA->NAc neurons using in vivo two-photon calcium imaging. Conversely, BLA-NAc neurons show decreased calcium activity in the sated conditions (pre-fasting as well as during re-feeding). Furthermore, using inhibitory DREADDS, we show that BLA->NAc neurons are not required for dark cycle food intake, but are necessary for the motivational response to seek a palatable reward (Ensure) in a progressive ratio task. Altogether, these results provide a mechanism by which this bidirectional modulation of these two BLA pathways can contribute to the execution of advantageous actions based on homeostatic needs.

## ANGEL JR SIRFA LOPEZ

Home Institution and State: Polytechnic University of Puerto Rico, PR Email: angel.sirfa@upr.edu Undergraduate Academic Level: Senior Undergraduate Major and Expected Graduation Date: Biomedical Engineering, 2020 Mentors/Advisors at Home Institution: Jose Garcia Arraras PhD

## **ENDURE Trainee Scientific Interest:**

My research interests are focused on developmental neurobiology and biomedical engineering. Since biomedical engineering consists of neural engineering, neurobiology and other sub-disciplines I'm eager to study these areas as a Ph.D. candidate or graduate researcher. In my current research with BP Endure I've learned about the regenerative process that the sea cucumber undergoes. I'm willing to see to what extent human beings can replicate this type of regeneration and identify where did we lose this genetic trait in our evolutionary process.

### ENDURE Trainee Career Goals and Plan:

My career goals consist of graduating from a B.S in biomedical engineering while successfully completing the NeurolD Program. After this I will apply to different graduate programs of my interests, these are neuroengineering, bioengineering, neurobiology and Medical Scientist Training Program. After this I plan to continue in the areas of transitional research so that I can leave a direct footprint in today's science. I plan to give lectures in a recognized university and influence students to continue on a scientific path just as my mentor is doing for me.

### **ENDURE Trainee Summer Research Experience:**

ENDURE Summer Research Experience Institution: University of Puerto Rico Rio Piedras

Mentors/Advisors at ENDURE Summer Research Experience Institution: Jose Garcia Arraras, PhD, and Paola V. Figueroa Delgado

### ENDURE Research Project Title: Characterization of radial nerve cord in vitro explants of sea cucumber Holothuria glaberrima

The vertebrate nervous system cannot regenerate itself in case of injury. However, other deuterostomes such as echinoderms have the capacity to regenerate their nervous system despite being related evolutionarily to humans. An echinoderm that eviscerates most of its organs as a defense mechanism and then regenerates them is the sea cucumber Holothuria glaberrima. The objective of this project is to study the regeneration of its nervous system. The development of an in-vitro system can be fundamental for the understanding of this organs' mechanism. The sea cucumber's nervous system is composed of 5 radial nerve cords and one pair of longitudinal muscles for each. The radial nerve cord is embedded into a body wall that has calcareous skeletal components. A dissection technique was developed that allowed us to extract the nerve cord with the minimum amount of surrounding tissues. This technique was developed to closely observe cell differentiation, dedifferentiation and programmed cell death taking place in the dissected nerves using an in-vitro system. Radial nerve cords were extracted and treated with collagenase in the presence of antibiotics. This treatment served to separate the longitudinal muscles and body wall from the radial nerve cord. The radial nerve cords were placed in culture utilizing supplemented medium to maintain cells inside the radial nerve cord alive. Explants were left in culture for several days. Histochemical studies were done to determine how cell dedifferentiation and cell death are taking place. Therefore, this study could help further understanding of how the regenerative process occurs in echinoderms that is limited in vertebrates.

## YANILKA SOTO

Home Institution and State: University of Puerto Rico Rio Piedras, PR Email: aklinay32@gmail.com Undergraduate Academic Level: Senior Undergraduate Major and Expected Graduation Date: Biology, 2020 Mentors/Advisors at Home Institution:

### **ENDURE Trainee Scientific Interest:**

As a scientist, I want to work towards understanding the biological basis of the mechanisms involved in the creation of memory and the decision-making process. I want to go beyond the boundaries of our methods, creating bridges that can transcend the gaps between Neuroscience and Psychology.

### **ENDURE Trainee Career Goals and Plan:**

My long-term goals include completing a PhD in Behavioral Neuroscience and conducting my own research. I am willing to add my own spark to the generation of new knowledge that could benefit not only my area but also different science disciplines.

### **ENDURE Trainee Summer Research Experience:**

ENDURE Summer Research Experience Institution:

Mentors/Advisors at ENDURE Summer Research Experience Institution:

ENDURE Research Project Title:

## ENDURE TRAINEE INFORMATION AND RESEARCH ABSTRACTS

## TENNESSEE STATE UNIVERSITY-NEUROSCIENCE EDUCATION AND RESEARCH VANDERBILT EXPERIENCE (TSU-NERVE)

TENNESSEE STATE UNIVERSITY Principal Investigator: *Dr. Kiesa Kelly* Partner Institutions: Vanderbilt University

#### PROGRAM DESCRIPTION:

The TSU-NERVE program in partnership with Vanderbilt University will prepare underrepresented students majoring in STEM disciplines at Tennessee State University, a Historically Black College and University, for graduate study and careers in neuroscience.

The TSU NERVE program will provide quality research, didactic, and professional development opportunities to support programmatic initiatives and goals: free Neuroscience courses, seminars, and retreats at Vanderbilt University; a 6-part workshop series on graduate school admissions that will involve directors of neuroscience doctoral programs from around the country; weekly neuroscience seminars during the academic year for the two years of the program; up to 3 semesters of neuroscience courses at Vanderbilt; research experiences in Vanderbilt neuroscience labs during the academic year; and summer research experiences including at Vanderbilt or one of the T32-funded neuroscience institutions (U. of Michigan, U. of Minnesota, and Oregon Health and Science University, Princeton University, University of Southern California) with which a partnership has been formed.

Carefully crafted retention plans will maximize TSU-NERVE trainee completion and success. These include: 1) a Vanderbilt Teaching Assistant to tutor students in rigorous Vanderbilt neuroscience coursework, 2) Vanderbilt mentors who will work with each TSU-NERVE student in his/her academic year lab placements, and 3) individual mentoring and advising from program directors that include evaluation of participant progress. Among enrolled TSU students, TSU-NERVE draws from the University Honors Program and TSU's NSF-funded HBCU-Undergraduate Programs for STEM majors.

TSU-NERVE will: 1) recruit talented (primarily African American) STEM majors from TSU interested in neuroscience, 2) provide appropriate support and scaffolding for these students as they receive quality research and didactic experiences at major research institutions, and 3) advance students from underrepresented backgrounds into doctoral programs in neuroscience with well-crafted professional development activities. Well-conceived admissions and retention plans will increase completion rates. Additionally, comprehensive formative and summative assessments will be conducted in both program evaluation and the career development of trainees to ensure the success of the TSU-NERVE program.

#### ADDITIONAL PROGRAM TEAM MEMBERS:

- Dr. Lisa A. de la Mothe Co-Program Director, Tennessee State University
- Dr. Hugh Fentress Co-Program Director, Tennessee State University
- Dr. David Zald Co- Investigator, Vanderbilt University

## DAVID BATTLE

Home Institution and State: **Tennessee State University, TN** Email: **dbattle7@my.tnstate.edu** Undergraduate Academic Level: **Senior** Undergraduate Major and Expected Graduation Date: **IDS, Dec 2018** Mentors/Advisors at Home Institution: **Hugh Fentress, PhD** 

### **ENDURE Trainee Scientific Interest:**

I am interested in molecular neuroscience. I am fascinated by Post-Traumatic Stress Disorder Syndrome from traumatic experiences that damages mechanisms of emotion

### ENDURE Trainee Career Goals and Plan:

After receiving my undergraduate degree, I would like to peruse either a Ph.D. or master's in biomedical research with a concentration in neuroscience. Afterwards, I would like to work for a biomedical company looking for cures aimed at people who suffer from Traumatic Experiences.

### **ENDURE Trainee Summer Research Experience:**

ENDURE Summer Research Experience Institution: Vanderbilt University

Mentors/Advisors at ENDURE Summer Research Experience Institution: Eric Delpire, PhD

### ENDURE Research Project Title: Cell Surface Expression of Wildtype and Mutant KCC3

The potassium chloride cotransporter, KCC3, is an electroneutral potassium chloride cotransporter that is expressed in both the peripheral and central nervous system. It is responsible for the outward movement of K+ and Cl- ions, helping to regulate cell volume. A loss-of-function (LOF) of KCC3 causes Hereditary Motor Sensory Neuropathy with Agenesis of the Corpus Callosum (HMSN/ ACC). HSMN/ACC is highly prevalent in individuals in the Charlevoix/Lac St-Jean region of Quebec, Canada. Characteristics of HSMN/ACC an overall loss of mobility, and delayed motor milestones with intellectual disabilities. Mouse models of KCC3 recapitulate the human phenotype except for the Agenesis. Interestingly, we have come across a cloning mutation in KCC3. This specific mutation "E289G" prevents trafficking of the protein to the plasma membrane. In spite of the modification, the E289G mouse appears wildtype. Interestingly in the sodium-dependent co-transporter NKCC1, Somasekharan *et al.* found mutations that disrupted NKCC1 inward transport. NKCC1 and KCC3 work in reciprocal regulation to regulate [Cl-] and cell volume (Figure 1). With these mutations in mind, the purpose of this project is to understand better why E289G appears to be wildtype in mice. We plan to assess this by assessing mutations in NKCC1to determine if they affect the surface expression of KCC3 co-transporter.

## AUTUMN BRUNSON

Home Institution and State: **Tennessee State University, TN** Email: **abrunson@my.tnstate.edu** Undergraduate Academic Level: **Sophomore** Undergraduate Major and Expected Graduation Date: **Biology, 2021** Mentors/Advisors at Home Institution: **Lisa de la Mothe, PhD, Hugh M. Fentress, PhD, and Kiesa Kelly, PhD** 

### **ENDURE Trainee Scientific Interest:**

My research involves the study of the Role of the Unfolded Protein Response on the Cuprizone Model of Remyelination. My specific research looks at two proteins believed to play a role in remyelination in hopes that if they do, we can somehow target them. My interests are in the physiology and cytoarchitecture of the brain, as well as in the neural mechanisms behind disease and neuronal cell death.

### ENDURE Trainee Career Goals and Plan:

My career goals include pursuing my MS and MD to become a neurosurgeon where I will specialize in neuro-trauma and neurocritical care.

### **ENDURE Trainee Summer Research Experience:**

ENDURE Summer Research Experience Institution: University of Minnesota

Mentors/Advisors at ENDURE Summer Research Experience Institution: Wensheng Lin, MD, PhD, and Sarrabeth Stone, PhD

# ENDURE Research Project Title: The Role of the Unfolded Protein Response on the Cuprizone Model of Remyelination

My summer research project consisted of the study of unresolved endoplasmic reticulum stress, caused by the accumulation of these unfolded and misfolded proteins, eventually leading to the activation of the Unfolded Protein Response (UPR) pathway. The UPR consists of three signaling pathways, set in place to respond to overwhelming endoplasmic reticulum (ER) stress. The Pancreatic Endoplasmic Reticulum Kinase (PERK) pathway, and the activating transcription factor 6a (ATF6a) pathway are the two pathways my lab is interested analyzing. The PERK pathway is responsible for stopping global protein synthesis within the cell and producing cytoprotective genes to combat the misfolded protein level. The ATF6 pathway is responsible for creating chaperone proteins to aid in the proper folding of the proteins. Our specific research aims involve determining whether or not PERK and ATF6 play a significant role in remyelination. To do so, we use the cuprizone model of remyelination which allows us to examine the components of remyelination in oligodendrocytes, and how they affect the cell's ability to remyelinate.

## SIMONE COMPTON

Home Institution and State: Tennessee State University, TN Email: scompto1@my.tnstate.edu Undergraduate Academic Level: Senior Undergraduate Major and Expected Graduation Date: Psychology, May 2019 Mentors/Advisors at Home Institution: Lisa De la Mothe, PhD, and Hugh Fentress, PhD

### **ENDURE Trainee Scientific Interest:**

The scientific research that I am interested in is neuropsychiatric disorders, brain cognition, brain trauma and its effects. To be more specific, I would like to focus on minority and disadvantaged populations.

### ENDURE Trainee Career Goals and Plan:

My primary career goal is to receive a Ph.D. in neuropsychology. After receiving my Ph.D., I hope to research neuropsychiatric disorders in minority populations. I hope to bring more awareness about neuropsychiatric disorders and bring assistance to communities that need it the most.

### **ENDURE Trainee Summer Research Experience:**

ENDURE Summer Research Experience Institution: University of Southern California

Mentors/Advisors at ENDURE Summer Research Experience Institution: Jeannie Chen, PhD and Jason Zevin

# ENDURE Research Project Title: The Effect of clock regulation on rhodopsin trafficking and disk membrane assembly in mouse rod photoreceptors

Investigating the effect of clock regulation on rhodopsin trafficking and disk membrane assembly can help explain the effect of biological and environmental factors on age-related vision loss. Transgenic mice were produced that express, in rods, a rhodopsin fused to DsRed variant (Timer) at its carboxyl terminus to facilitate visualization of rhodopsin incorporation into the rod outer segment (ROS) by live-cell imaging. The transgene allows us to visualize rhodopsin in better resolution in mice ROS which has not be previously done. The transgenic mice that were raised in a normal diurnal cycle (12 hr light; 12 hr dark) were exposed to the following treatment: 20 days in constant darkness and 20 days of constant light. Mice that were reared in total darkness were also included. A PCR protocol was used to genotype mice positive with the timer gene. Mice that were positive for the timer gene eyes were dissected to remove the retina to see rhodopsin bands with live cell imaging. The brains from the same mice were dissected to find the Suprachiasmatic nucleus (SCN) - thought to regulate physiological circadian rhythms - to perform RT-PCR to confirm SCN any effects on rhodopsin trafficking and disk membrane assembly in mouse rod photoreceptors.

## SHELBY DAVIS

Home Institution and State: **Tennessee State University, TN** Email: **sdavis82@my.tnstate.edu** Undergraduate Academic Level: Undergraduate Major and Expected Graduation Date: **Biology, May 2020** Mentors/Advisors at Home Institution:

### **ENDURE Trainee Scientific Interest:**

The scientific research that I am interested in includes drug and addictions with a focus on the neural mechanisms underlining the reward pathway.

### ENDURE Trainee Career Goals and Plan:

I plan to attend medical school and am considering pursuing an M.D./Ph.D. in order to achieve my primary career goal of becoming a physician with a strong foundation for conducting research as a means to improve medical understanding and practice. I am currently taking neuroscience coursework and will begin my research experience this spring at Vanderbilt University.

### **ENDURE Trainee Summer Research Experience:**

ENDURE Summer Research Experience Institution:

Mentors/Advisors at ENDURE Summer Research Experience Institution:

ENDURE Research Project Title:

I do not currently have research experience related to this program as my research experience will begin spring 2019 at Vanderbilt University.

## JAZZ FIELDS

Home Institution and State: **Tennessee State University, TN** Email: **jz.fields15@gmail.com** Undergraduate Academic Level: **Senior** Undergraduate Major and Expected Graduation Date: **Biology, May 2019** Mentors/Advisors at Home Institution: **Hugh Fentress, PhD, and Lisa de la Mothe PhD** 

### **ENDURE Trainee Scientific Interest:**

My research interests are in the area of the reward circuitry in the brain. Specifically, the impact of sex on the afferent projections in the brain. I would like to learn more about the medial prefrontal cortex, and Nucleus Accumbens and the reward circuitry between these structures. Ultimately, I want to learn more about the brain reward system so we can formulate drugs to attack the proper brain pathways to combat drug addiction.

### **ENDURE Trainee Career Goals and Plan:**

Currently, I am interested in physical therapy as my career choice. Specifically, neurodegenerative diseases that cause abnormalities in motor movement and degeneration of neurons, such as Parkinson's disease. I am interested in the brain makeup of these diseases and studying why and how the body reacts physically to these diseases.

### **ENDURE Trainee Summer Research Experience:**

ENDURE Summer Research Experience Institution:

Mentors/Advisors at ENDURE Summer Research Experience Institution:

ENDURE Research Project Title:

## **ELYSE LANG**

Home Institution and State: Tennessee State University, TN Email: elang2@my.tnstate.edu Undergraduate Academic Level: Senior Undergraduate Major and Expected Graduation Date: Biology, May 2019 Mentors/Advisors at Home Institution: Hugh Fentress, PhD, Lisa de la Mothe, PhD, and Kiesa Kelly, PhD

### **ENDURE Trainee Scientific Interest:**

The specific scientific/research interest I am intrigued by involves neuronal behavioral clinical research. I am also interested in studying the comparison of typically and atypically developing infants' reactions with various behavioral stimuli.

### **ENDURE Trainee Career Goals and Plan:**

I plan on to attend medical school to obtain a D.O. in Pediatric Medicine. I also plan to specialize in either Neuroscience, General Medicine, or Psychiatry.

### **ENDURE Trainee Summer Research Experience:**

ENDURE Summer Research Experience Institution:

Mentors/Advisors at ENDURE Summer Research Experience Institution:

# ENDURE Research Project Title: Behavioral State of Infants Interacting with a Robot in a Contingent Learning Paradigm

An infant's behavioral state within a learning environment influences their ability to learn. An infant who is alert is in a behavioral state optimal for learning, while an infant who is fussy or uninterested is not. We explore here whether an infant-sized humanoid robot that provides interactive motion, light, and auditory stimuli and can promote an alert state in infants. Twelve infants with typical development between the ages of 6 and 8 months participated. They came into the laboratory for one session of about an hour. Each session consisted of a 2 minute baseline, 8 minute contingency phase, and a second 2 minute baseline. We found that the infants' behavior was alert throughout the sessions while interacting with the robot, supporting that they were in an optimal state for learning to occur. We also found that at the end of the sessions, after the robot stopped responding, the infants were more often fussy or crying. Our preliminary results support that the robot was generally able to engage the infant in an alert state for 8 minutes. In future work we will explore whether the infants learned or did not learn the contingency.

## **BRIANNA McCOLLUM**

Home Institution and State: Tennessee State University, TN Email: briannamccollum98@gmail.com Undergraduate Academic Level: Junior Undergraduate Major and Expected Graduation Date: Biology, May 2020 Mentors/Advisors at Home Institution: Lisa de la Mothe, PhD, and Hugh Fentress, PhD

### **ENDURE Trainee Scientific Interest:**

I have a variety of research interests that include drugs and addiction, cognitive processes of the brain, and the effects of trauma on neurodevelopment in children and adolescents.

### ENDURE Trainee Career Goals and Plan:

My current plans include attending medical school and potentially pursuing an MD/PhD While I am currently conducting coursework in neuroscience I will begin my neuroscience research experience at Vanderbilt University in the spring 2019.

### **ENDURE Trainee Summer Research Experience:**

ENDURE Summer Research Experience Institution:

Mentors/Advisors at ENDURE Summer Research Experience Institution:

ENDURE Research Project Title:

I will begin my neuroscience research experience at Vanderbilt University in the spring 2019.

## ALIYAH MUHAMMAD

Home Institution and State: Tennessee State University, TN Email: amuham11@my.tnstate.edu Undergraduate Academic Level: Junior Undergraduate Major and Expected Graduation Date: Biology, Dec 2020 Mentors/Advisors at Home Institution: Hugh Fentress, PhD, and Lisa de la Mothe, PhD

### **ENDURE Trainee Scientific Interest:**

I am interested in conducting research related to cognitive functioning and neurodegenerative disorders.

### **ENDURE Trainee Career Goals and Plan:**

After completion of my Bachelor of Science in Biology I plan to continue my academics and enter into an M.D./Ph.D. program with an emphasis on neuroscience. This will allow me to pursue a career in which I can conduct research related to my interests in cognitive functioning and neurodegenerative disorders which can then aid in my understanding and treatment of related conditions.

### **ENDURE Trainee Summer Research Experience:**

ENDURE Summer Research Experience Institution:

Mentors/Advisors at ENDURE Summer Research Experience Institution:

ENDURE Research Project Title:

I have no current research project as I will begin my neuroscience research experience in the spring of 2019 at Vanderbilt University.

## COMPLETE ENDURE STUDENT ACTIVITIES AT SFN: November 3-5, 2018

| FRIDAY   | 4:00 – 7:00pm Building an ENDURing Network   |  |  |  |
|----------|--|--|--|--|
|          | 3 <sup>rd</sup> Annual BP-ENDURE SfN Kick-Off Event  |  |  |  |
| INOV 2   | UC San Diego   |  |  |  |
|          | Center for Neural Circuits and Behavior  |  |  |  |
|          |  |  |  |  |
|          | 3:00 – 3:30pm Loading buses at pickup point for 3:30pm departure from<br>Convention Center                             |  |  |  |
|          | 4:00 – 4:30pm Light Appetizers and Refreshments, BINGO Icebreaker  |  |  |  |
|          | 4:30 – 4:40pm Opening remarks  |  |  |  |
|          | 4.40 E.O.D.m. Welsome and Introduction to UCCD   |  |  |  |
|          | 4:40 - 5:00pm welcome and introduction to UCSD   |  |  |  |
|          | 5:00 – 5:40pm Spotlight on UCSD Graduate Student research and Elevator Pitches   |  |  |  |
|          | 5:40 – 6:50pm ENDURE Neuroscience Trivia and "Shark Tank"  |  |  |  |
|          | 6:50 – 7:00pm Award presentation and Closing Remarks   |  |  |  |
|          |  |  |  |  |
| SATURDAV | 7:00 – 11:30 am 8 <sup>TH</sup> ANNUAL NIH BLUEPRINT ENDURE MEETING  |  |  |  |
| SATURDAT |  |  |  |  |
| Nov 3    | Hilton San Diego Bayfront, Sapphire Ballroom   |  |  |  |
|          | (1 Park Blvd San Diego CA 92101)   |  |  |  |
|          | (IT AIN DIVA, SAIT DIEGO, ON SZISI)  |  |  |  |
|          | 7.00 7.00 em Decistration  |  |  |  |
|          | 7:00 – 7:30 am Registration<br>7:30 – 9:45 am Featured Speakers<br>9:45 – 11:30 am T32 Recruitment Fair and Networking |  |  |  |
|          |  |  |  |  |
|          |  |  |  |  |
|          |  |  |  |  |
|          | 1:00 – 3:00pm Graduate School Fair   |  |  |  |
|          | Location: SDCC, Upper Level, Sails Pavilion  |  |  |  |
|          |  |  |  |  |
|          | Meet face-to-face with student advisors, program faculty, and graduate school  |  |  |  |
|          | representatives at the Graduate School Fair.   |  |  |  |
|          |  |  |  |  |
|          | 6:30 - 8:30pm Diversity Fellows Poster Session   |  |  |  |
|          |  |  |  |  |
|          |  |  |  |  |
|          |  |  |  |  |
|          | 7:30 – 9:30pm CAREER DEVELOPMENT TOPICS: A NETWORKING EVENT  |  |  |  |
|          | Location: SDCC Hall B  |  |  |  |
|          |  |  |  |  |
|          | Experienced neuroscientists will offer advice on a wide range of topics in an informal,                                |  |  |  |
|          | roundtable format. Topics include work-life balance, securing grants, career transitions,                              |  |  |  |
|          | careers away from the bench, choosing graduate schools and postdoctoral fellow positions.                              |  |  |  |
|          | and many others. Participants from diverse backgrounds, fields, and work sectors are                                   |  |  |  |
|          | encouraged to attend.  |  |  |  |
|          |  |  |  |  |
|          |  |  |  |  |

# COMPLETE ENDURE STUDENT ACTIVITIES AT SFN: November 3-5, 2018

| SUNDAY  | MORNING AND AFTERNOON   |  |  |
|---------|---|--|--|
|         | Featured lectures • Symposia  |  |  |
| INOV 4  | • Special lectures • Minisymposia   |  |  |
|         | Plan Your Itinerary for Neuroscience 2018   |  |  |
|         | 9:00 – 11:00am Face-to-Face Networking: Building and Maintaining<br>Professional Relationships (Professional Development Workshop)<br>Location: SDCC 30E<br>Moderator: Rae Nishi, PhD                             |  |  |
|         | The moderator will give a brief talk about face-to-face networking, after which panel members will introduce themselves and each answer a question from the moderator. This will be a highly interactive session. |  |  |
|         | <b>12:00 – 2:00pm Graduate School Fair</b><br>Location: SDCC, Upper Level, Sails Pavilion   |  |  |
|         | Meet face-to-face with student advisors, program faculty, and graduate school representatives at the third annual Graduate School Fair.   |  |  |
|         |   |  |  |
| MONDAY  | MORNING AND AFTERNOON   |  |  |
|         | Attend Scientific Program   |  |  |
| NOV 5   | • Special lectures • Minisymposia   |  |  |
|         | Plan Your Itinerary for Neuroscience 2018   |  |  |
|         |   |  |  |
|         | 12:00 – 2:00pm GRADUATE SCHOOL FAIR   |  |  |
|         | Location: SDCC, Upper Level, Sails Pavilion   |  |  |
|         | Meet face-to-face with student advisors, program faculty, and graduate school representatives at the third annual Graduate School Fair.   |  |  |
|         |   |  |  |
|         | Location: Marriott Marquis, South Tower Marina F  |  |  |
| THEODAY | MORNING AND AFTERNOON   |  |  |
| TUESDAT | Attend Scientific Program   |  |  |
| Nov 6   | Featured lectures   Symposia  Special lectures   Minisymposia   |  |  |
|         |   |  |  |
|         | Plan Your Itinerary for Neuroscience 2018   |  |  |
|         | 12:00 – 2:00pm Graduate School Fair   |  |  |
|         | Location: SDCC, Upper Level, Sails Pavilion   |  |  |
|         | Meet face-to-face with student advisors, program faculty, and graduate school representatives at the third annual Graduate School Fair.   |  |  |

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Huda Zoghbi Professor Baylor College of Medicine hzoghbi@bcm.edu This is the last page of the booklet but turns the first page of your future. ENDURE alumni are changing the face of neuroscience research and making an impact on research knowledge. Stay connected to the ENDURE network and as scientists use the evidence below to replicate your own success!

#### ENDURE Trainees and Alumni

An ENDUREing Network: Visit and like the ENDURE Facebook page:

- builds a support system
- facilitates future transition & research collaboration
- provides awareness of neuroscience resources within and outside of NIH
  www.facebook.com/BP.ENDURE

ENDURE Trainee Outcomes (as of Sept. 2017): 123 of 202 alumni (~60%) are enrolled in graduate programs!

- 64 in neuroscience Ph.D. programs
- 17 are in M.D./Ph.D. or M.D.
- 42 in MS degree/postbac neuroscience programs

| Albert Einstein College of<br>Medicine         | New Mexico State University            | University of Houston                           |
|--|--|---|
| Baylor University                              | New York University                    | University of Illinois in Chicago               |
| Brown University                               | Oregon Health & Science University     | University of New Mexico                        |
| City University of New York                    | Ponce School of Medicine               | University of North Carolina, Chapel Hill       |
| Colorado State University                      | Scripps Research Institute             | University of Oregon                            |
| Columbia University                            | Stony Brook University                 | Ohio State University                           |
| Emory  | Texas Tech                             | University of Utah                              |
| Georgetown University                          | University of California, Berkeley     | UT-Houston                                      |
| Harvard University                             | University of Colorado Denver          | UT Health Science Center – San Antonio          |
| Cornell University                             | University of Alabama at<br>Birmingham | University of Pennsylvania                      |
| Johns Hopkins University<br>School of Medicine | UMASS                                  | University of Texas Southwestern Medical Center |
| Miami University                               | University of Arizona                  | Washington University                           |
| МІТ  | University of Michigan                 | Yale University                                 |

#### Ph.D. Graduate Programs of ENDURE Alumni

The remaining known ENDURE alumni (n=57) not in graduate programs are doing great things in other fields and/or continuing a pathway in biomedical research:

- Science-related, non-research = 17: nursing, medical scribe, physical therapy, pharmacy, dentistry, physician assistant
- Academic Research Staff = 11: research technicians
- Non-science related = 9: law, business, IT
- Industry = 7: assistant scientist, technician, clinical trial assistant
- **Teaching** = 4: UG teaching assistant, high school, Teach for America
- Government research = 2: CDC, FDA
- Non-profit research = 1; Texas Biomedical research Institute

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## THANK YOU FOR YOUR PARTICIPATION